Eruptive stars spectroscopy

Cataclysmics, Symbiotics, Novae, Supernovae

ARAS Eruptive Stars
Information letter n° 15 #2015-03 31-03-2015
Observations of March 2015

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News

Second nova of the year in Sagitarius
Nova Sgr# 2 2015
= PNV J18365700-2855420
Discovered by John Seach, at mag 6.0 using DSLR and 50mm f/1.0 lens the 2015 March 15.634 UT

Coordinates:
R.A. 18 36 56.84
Dec. -28 55 39.8 (2000.0)

The fourth nova of the year :
Nova Oph 2015
= PNV J17291350-1846120
Discovered by Yukio Sakurai at mag 12.2 on 2015 March 29.766 UT
R.A. 17 29 13.58 Dec. -18 46 11.7

ARAS Spectroscopy

ARAS Web page
http://www.astrosurf.com/aras/

ARAS Forum
http://www.spectro-aras.com/forum/

ARAS list
https://groups.yahoo.com/neo/groups/spectro-l/info

ARAS preliminary data base
http://www.astrosurf.com/aras/Aras_DataBase/DataBase.htm

ARAS BeAM
http://arasbeam.free.fr/?lang=en

Contents

Acknowledgements :
V band light curves from AAVSO photometric data base

Authors :
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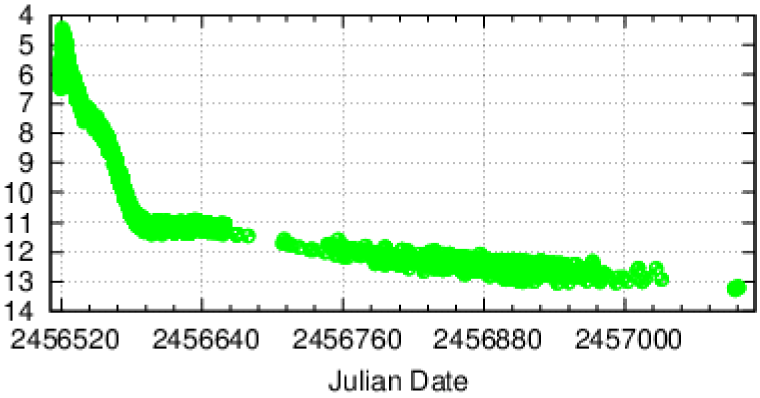
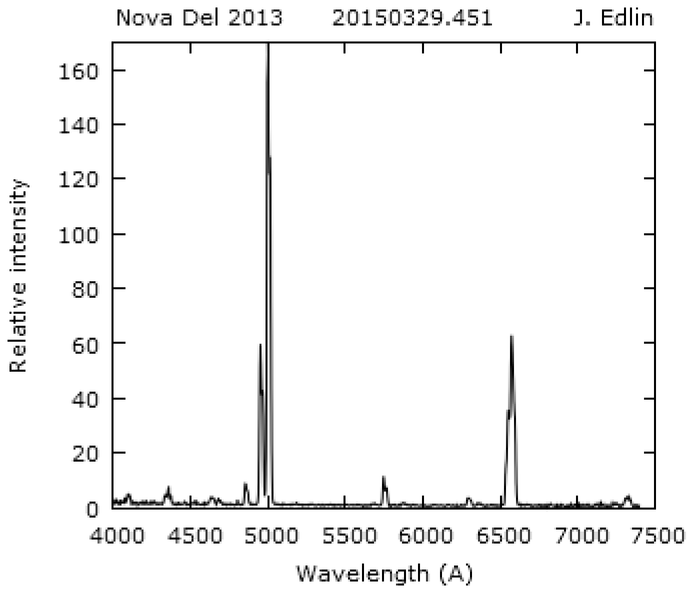
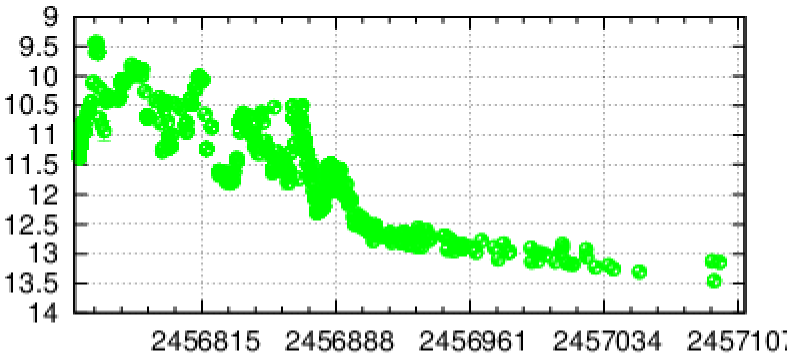
Status of current novae 1/2

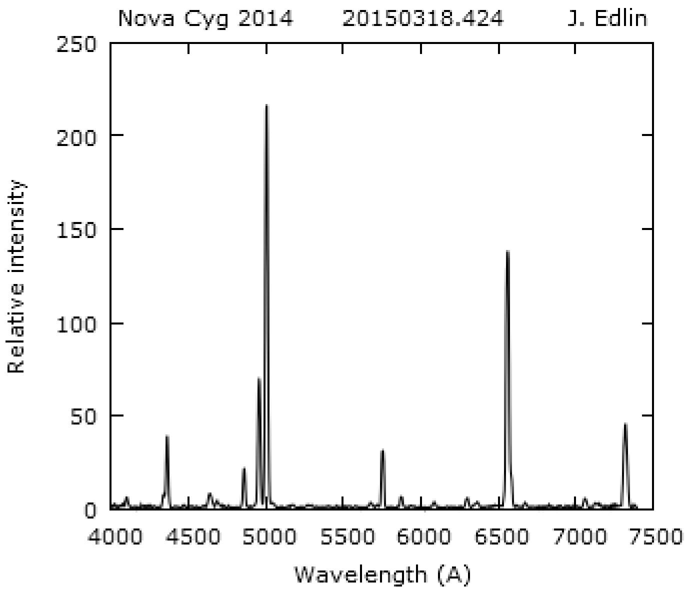
Nova Del 2013	V339 Del
Maximum	14-08-2013
Days after maximum	594
Current mag V	13.2
Delta mag V	8.8



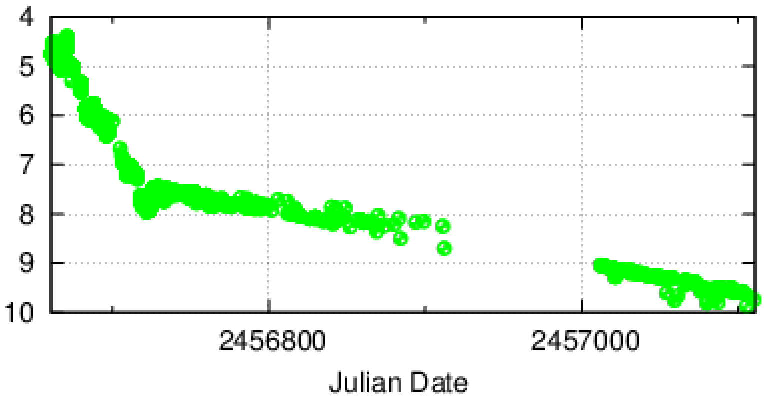


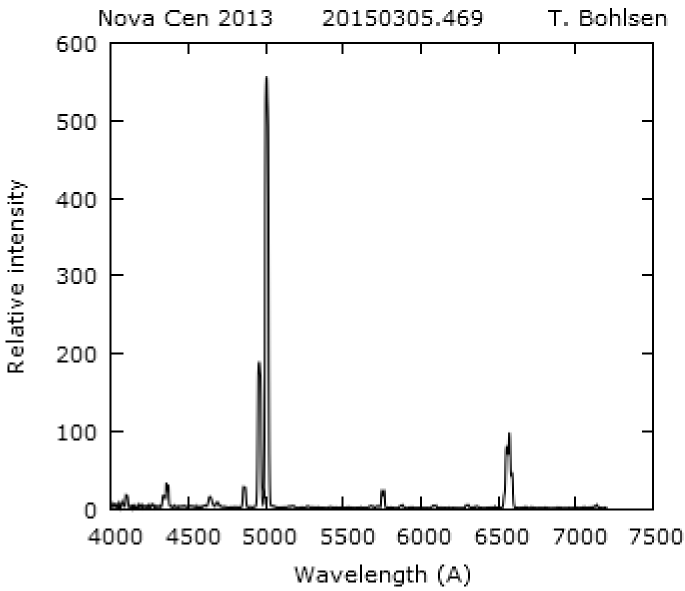
Nova Cyg 2014	V2659 Del
Maximum	09-04-2014
Days after maximum	356
Current mag V	13.5
Delta mag V	4.4





Nova Cen 2013	V1369 Cen
Maximum	14-12-2013
Days after maximum	472
Current mag V	9.8
Delta mag V	6.3

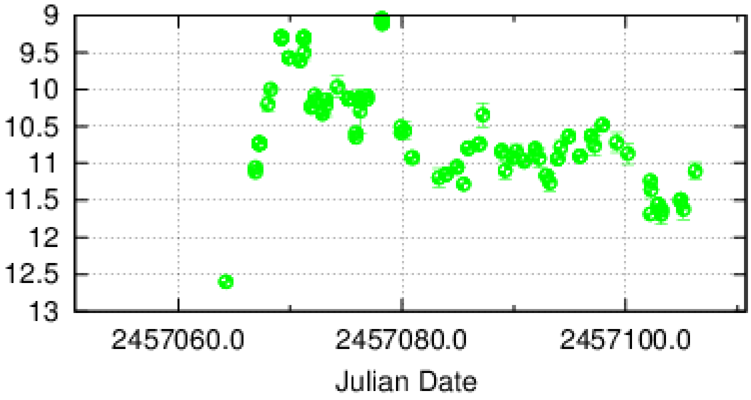




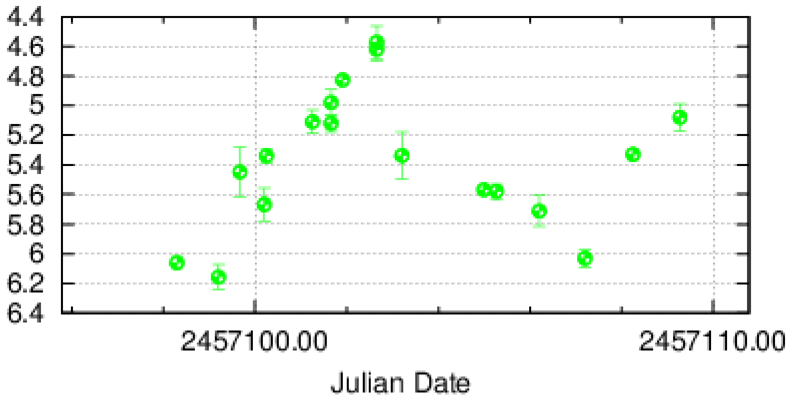
ARAS DATA BASE : http://www.astrosurf.com/aras/Aras_DataBase/Novae.htm

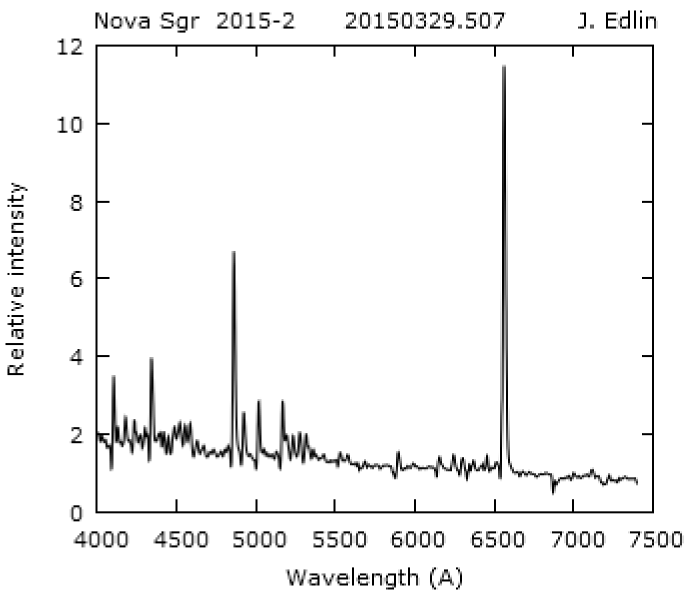
Status of current novae 2/2

NovaSgr 2015	
Maximum	15-02-2015
Days after maximum	44
Current mag V	10.9
Delta mag V	1.6



NovaSgr 2015 #2	
Maximum	21-03-2015
Days after maximum	10
Current mag V	5
Delta mag V	0.5





Nova Oph 2015	
Maximum	01-04-2015
Days after maximum	
Current mag V	
Delta mag V	

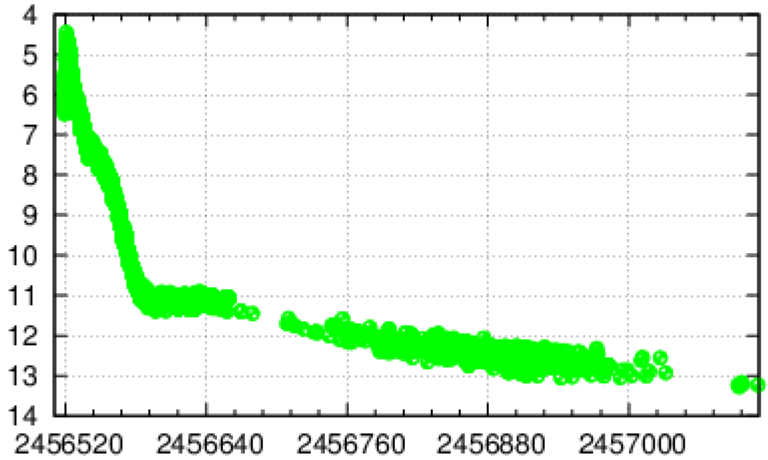
ARAS DATA BASE : http://www.astrosurf.com/aras/Aras_DataBase/Novae.htm

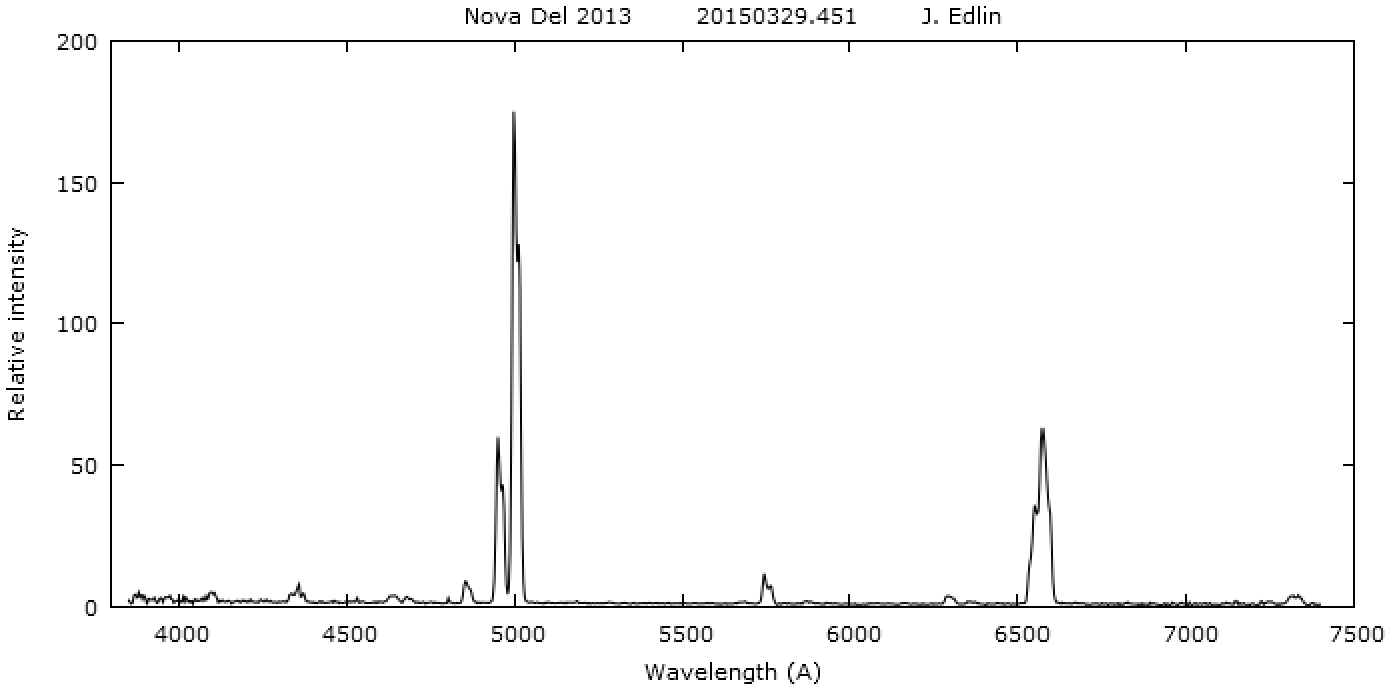
NOVAE

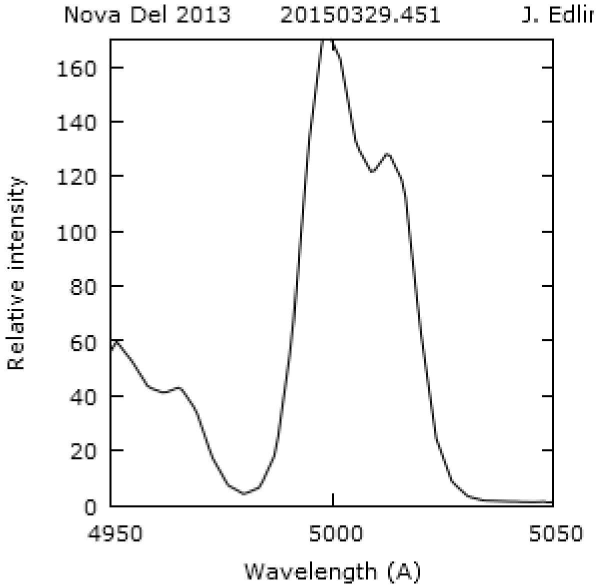
Nova Del 2013 = V339 Del

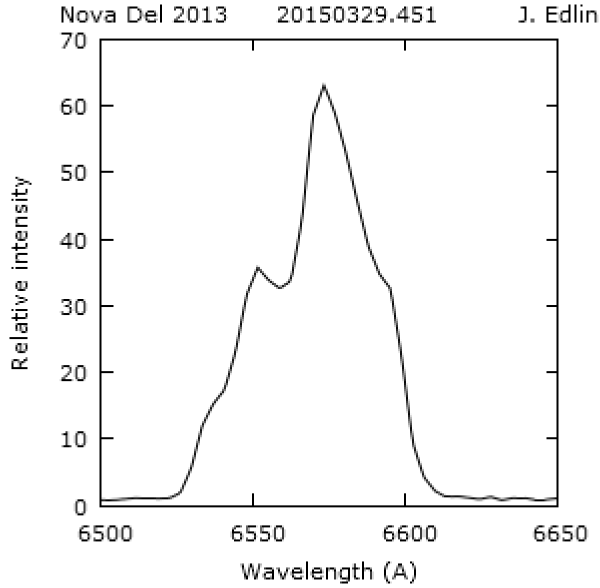
Luminosity
Mag V = 13.3 (31-03-2015)
Slow decline

Spectroscopy
Nova Cyg in nebular phase





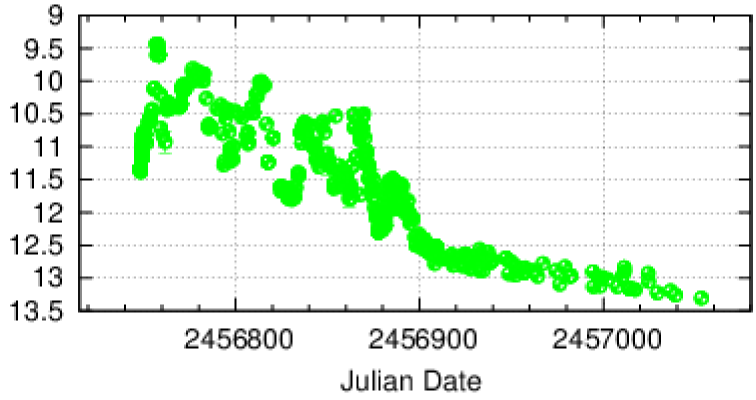




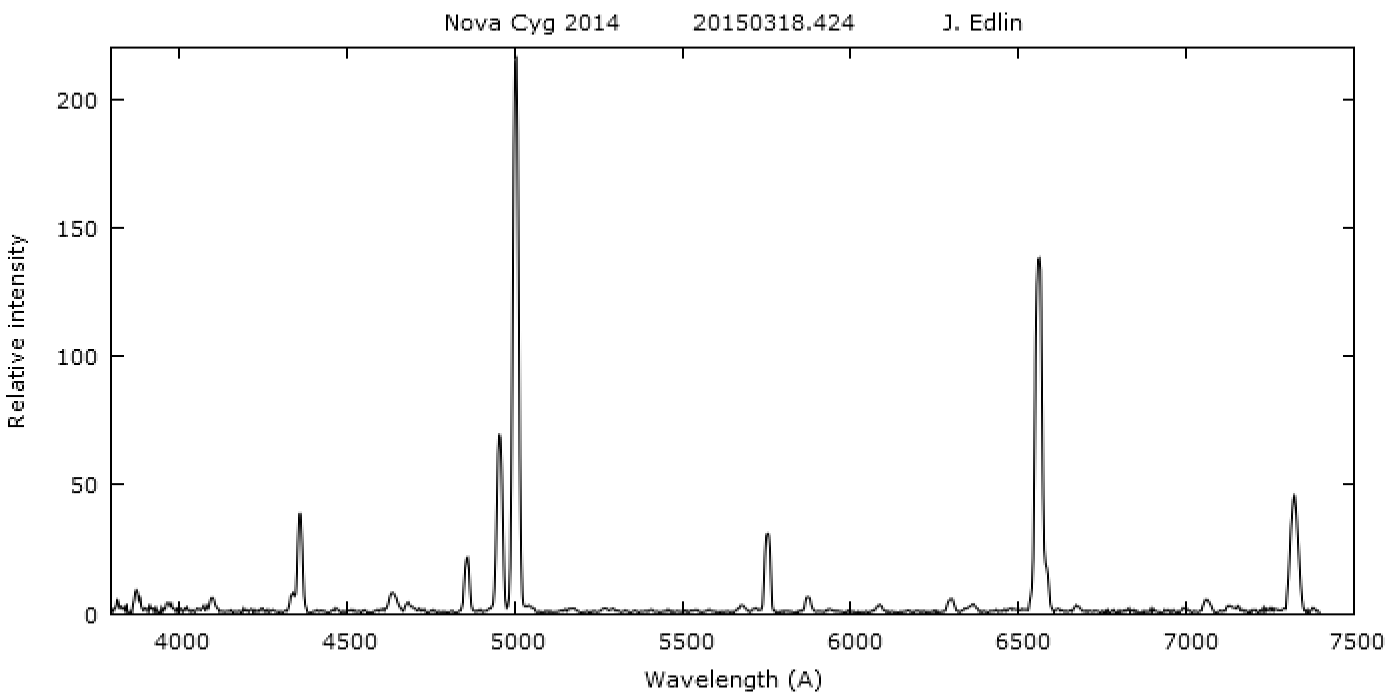
Nova Cyg 2014 = V2659 Cyg

Luminosity
Mag V = 13.3 (30-01-2015)
Slow decline

Spectroscopy
Nova Cyg in nebular phase



Spectroscopy
Nebular spectrum with noticelly [OII] still intense
See also : [N II] appears in the red part of H alpha



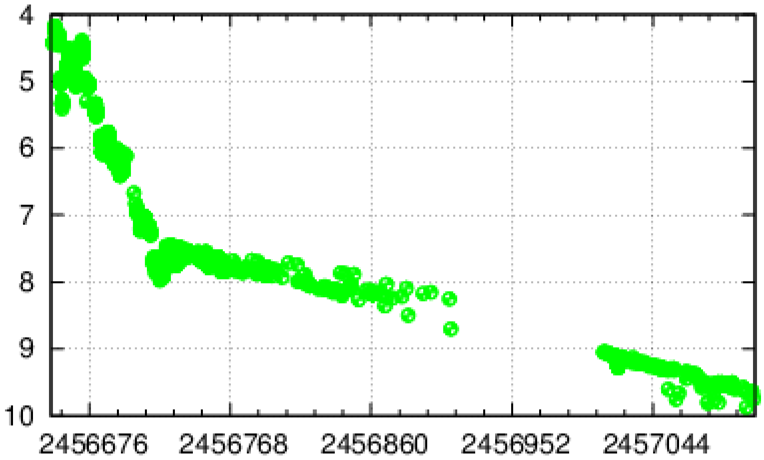
Observers : Tim Lester | Christian Buil | Paul Gerlach | Olivier Garde | François Teyssier | Jacques Montier | Antonio Garcia | Joan Guarro
Paolo Berardi | Franck Boubault | Peter Somogyi | Miguel Rodriguez | F. Boubault | O. Thizy | D. Boyd | J. Edlin

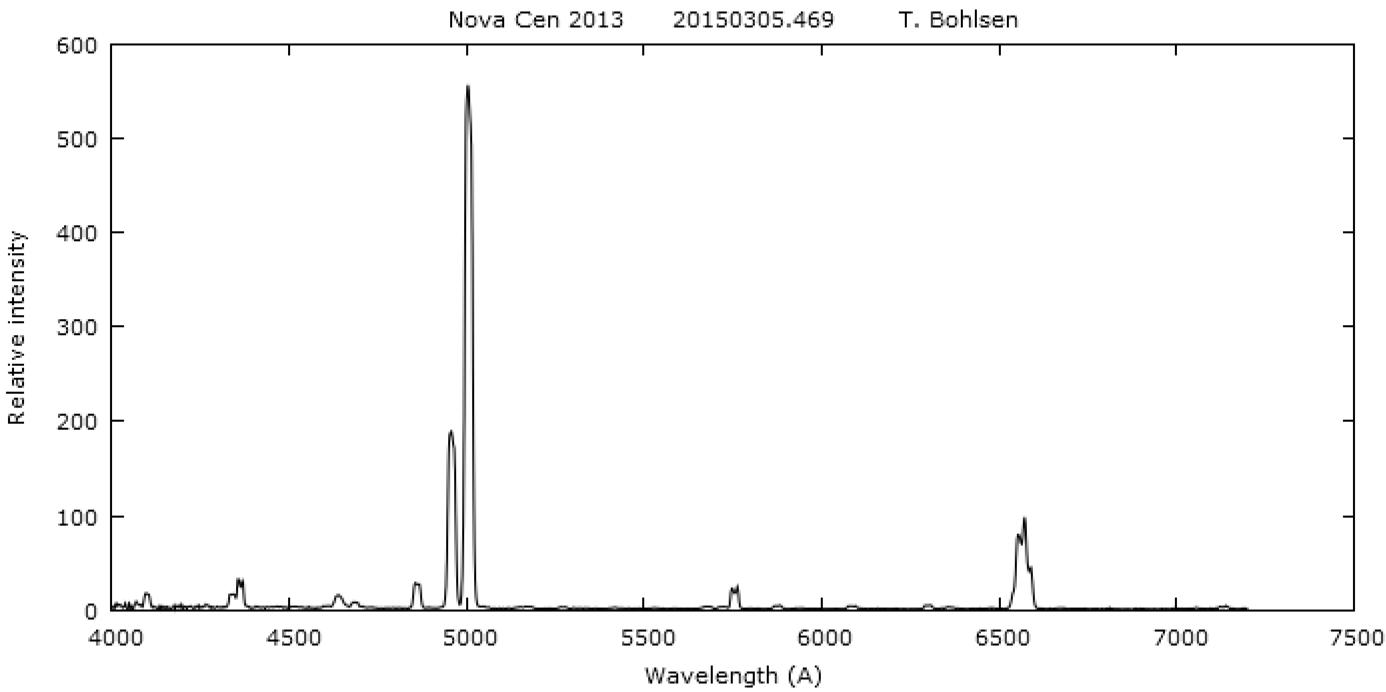
ARAS DATA BASE : 210 spectra http://www.astrosurf.com/aras/Aras_DataBase/Novae/Nova-Cyg-2014.htm
Web Page : http://www.astrosurf.com/aras/novae/NovaCyg2014.html

Nova Cen 2013 = V1369 Cen

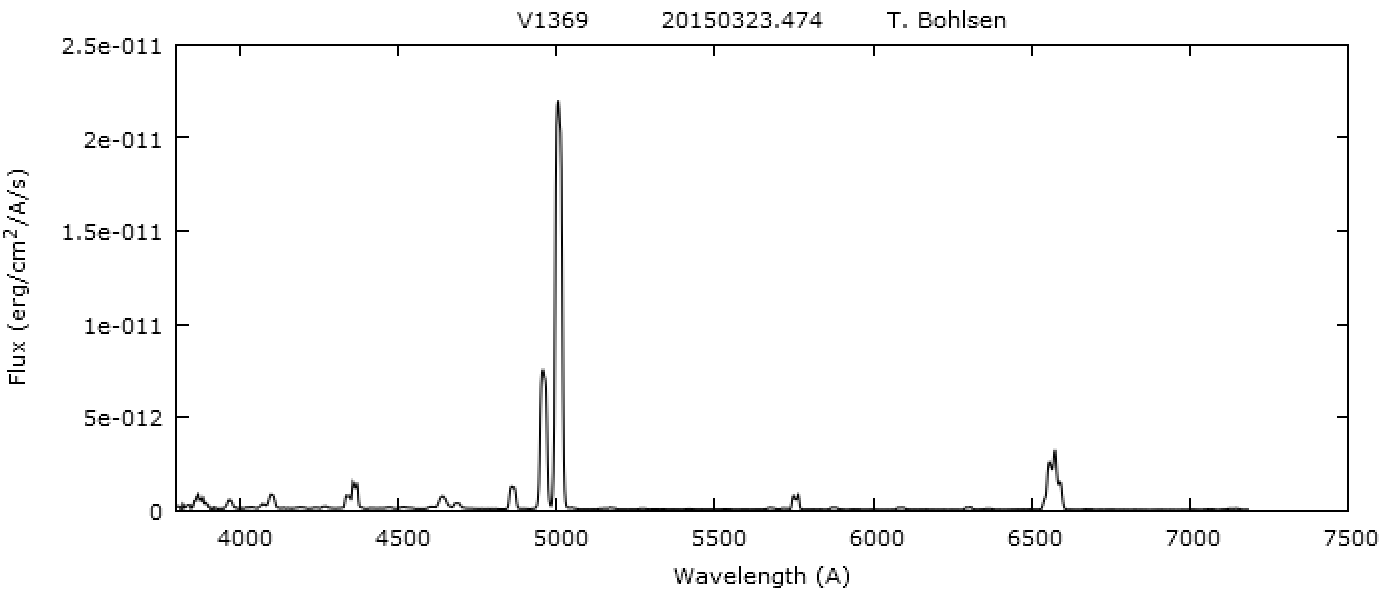
Luminosity
Mag V = 9.5 (28-02-2015)
Slow decline

Spectroscopy
Nova Cen in nebular phase





Terry Bohlsen - 05-03-2015 - LISA R = 1000



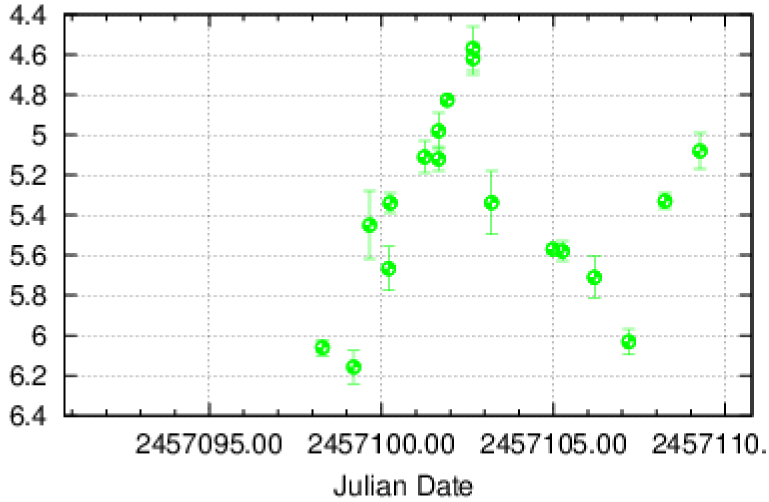
Terry Bohlsen - 05-03-2015 - LISA R = 1000

Nova Sgr#2 2015 (= PNV J18365700-2855420)

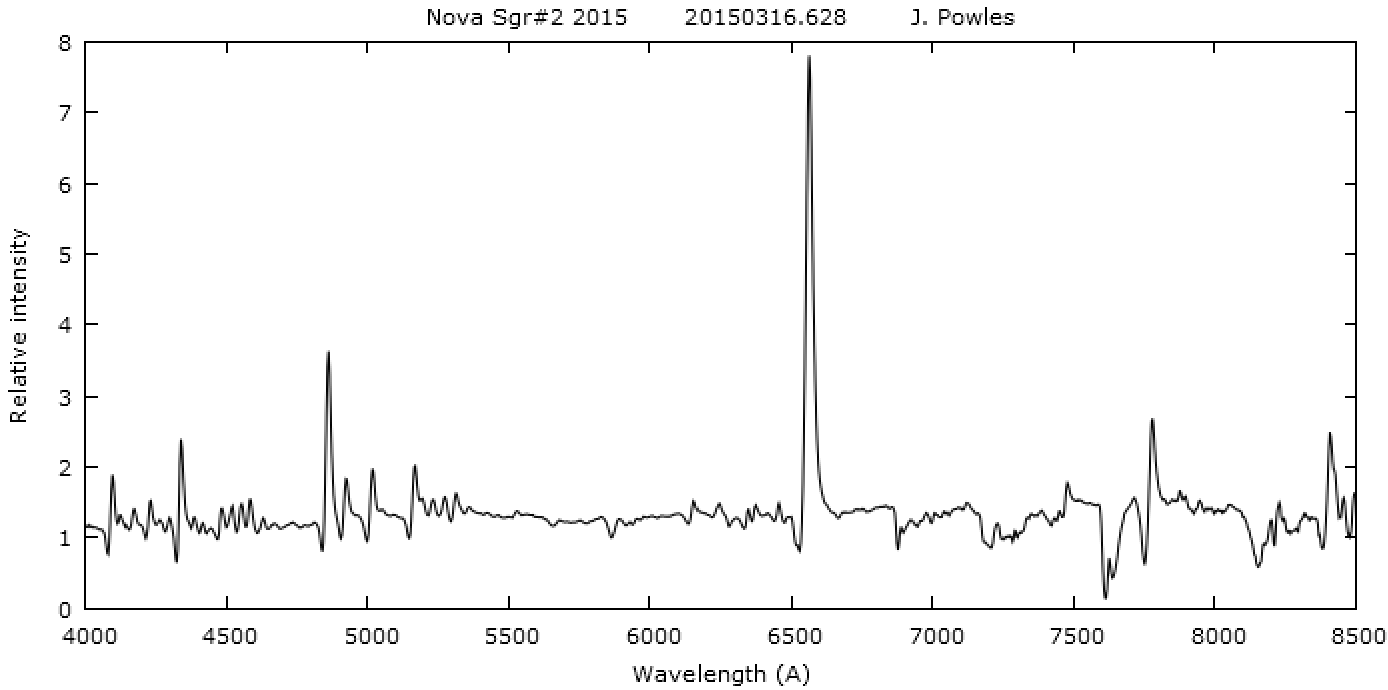
Coordinates (2000.0)	
R.A.	18 36 57.0
Dec.	-28 55 42.0

The second nova of the year in Sagittarius has been discovered by J. Seach at mag 6 on 2015 March 15.634.

Jonathan Powles got a spectrum (March, 16.628) just after the discovery, during the rising phase, showing clearly a Fe II type spectrum



The AAVSO V Band light curve shows a maximum on at Mag V = 4.6 followed by a rapid decline of luminosity and a first oscillation with a rebrighting of 1 mag



Jonathan Powles L-200 150 l/mm R = 700

The maximum velocity from Hα absorption is 2800 km.s^{-1}

ATEL #7230

Spectroscopic Observation of PNV J18365700-2855420 with the Liverpool Telescope

C. Williams (LJMU), M. J. Darnley (LJMU), M. F. Bode (LJMU)

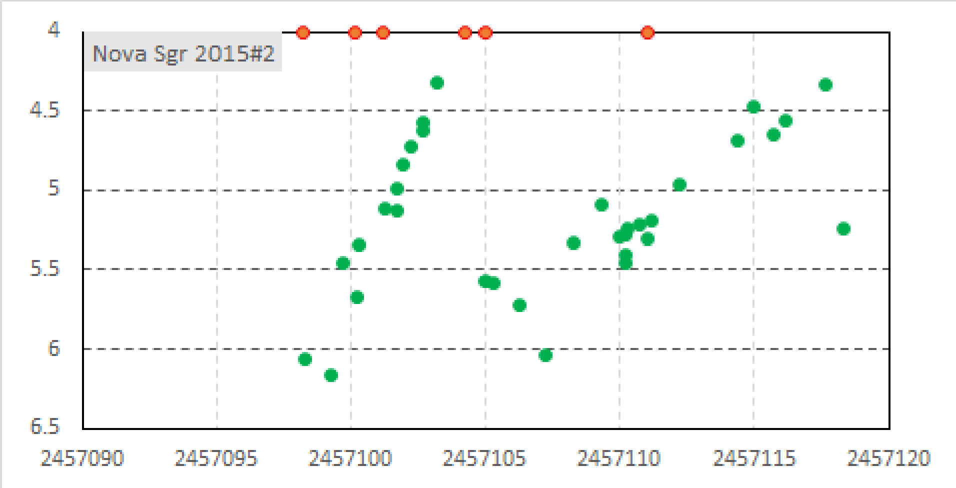
An optical spectrum of PNV J18365700-2855420 (see http://www.cbat.eps.harvard.edu/unconf/followups/J18365700-2855420.html">CBAT) was obtained using the FRODOspec spectrograph on the Liverpool Telescope at 2015 March 16.27 UT. The spectrum shows strong Balmer series emission exhibiting P Cygni profiles with velocities of ~2800 km/s. Numerous Fe II emission lines (also with P Cygni profiles) are also seen, along with O I, Si II and Mg II features. This confirms that PNV J18365700-2855420 is a bright classical nova of the Fe II spectral type and follow-up observations are encouraged.

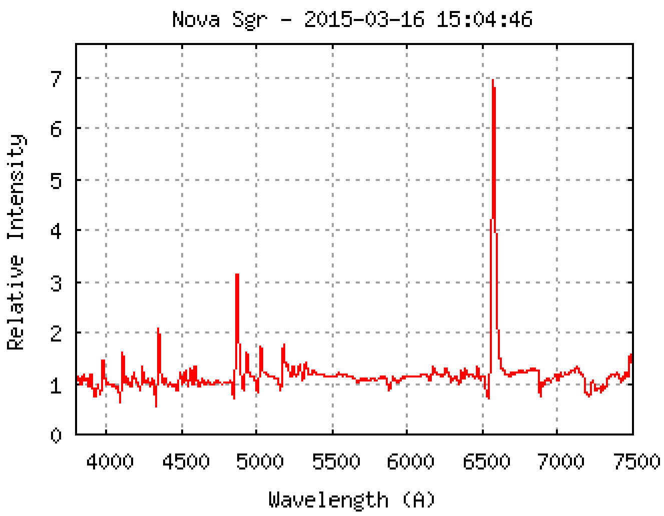
ARAS Data Base : http://www.astrosurf.com/aras/Aras_DataBase/Novae/Nova-Sgr2-2015.htm

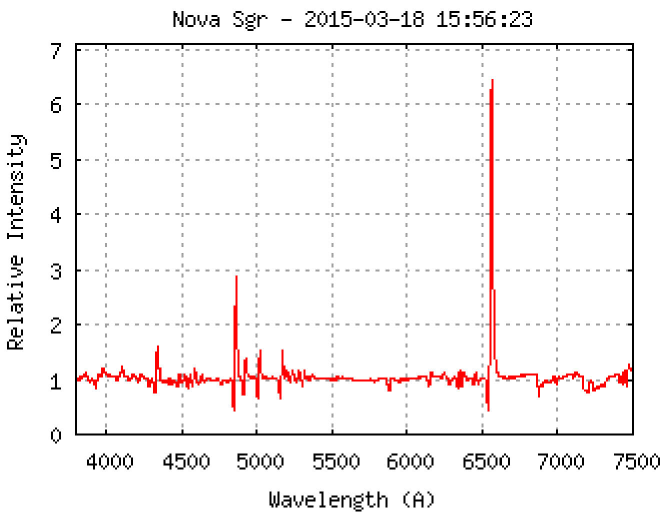
Nova Sgr#2 2015 (= PNV J18365700-2855420)

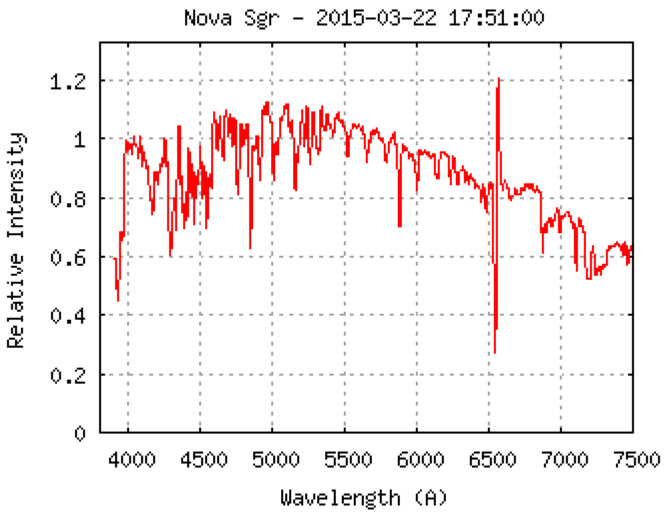
Spectral evolution thow low resolution spectra obtained by Jonathan Powles and Jim Edlin

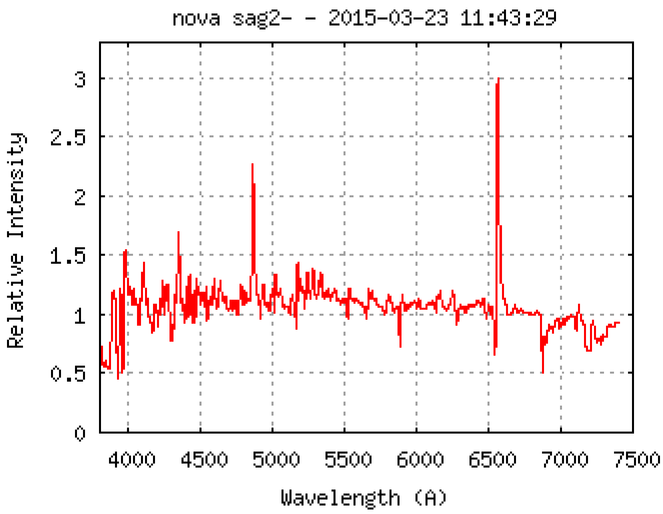
AAVSO V Band lightcurve
Red dot : spectra of this page

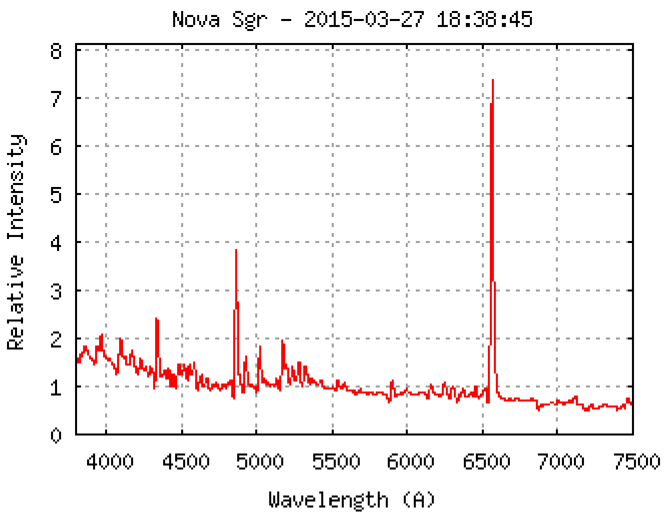


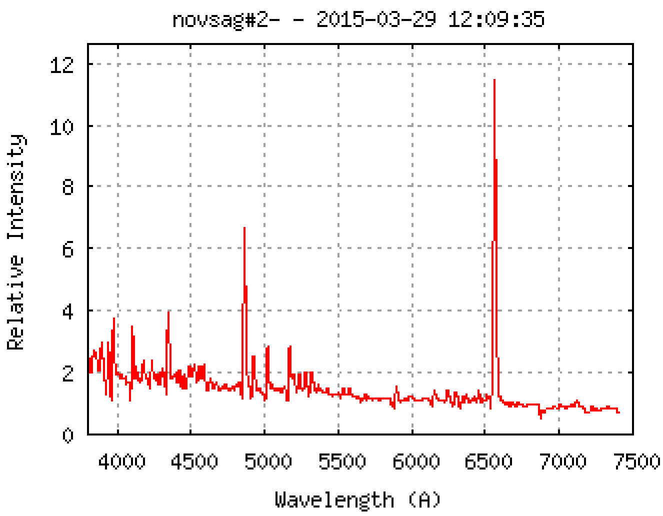










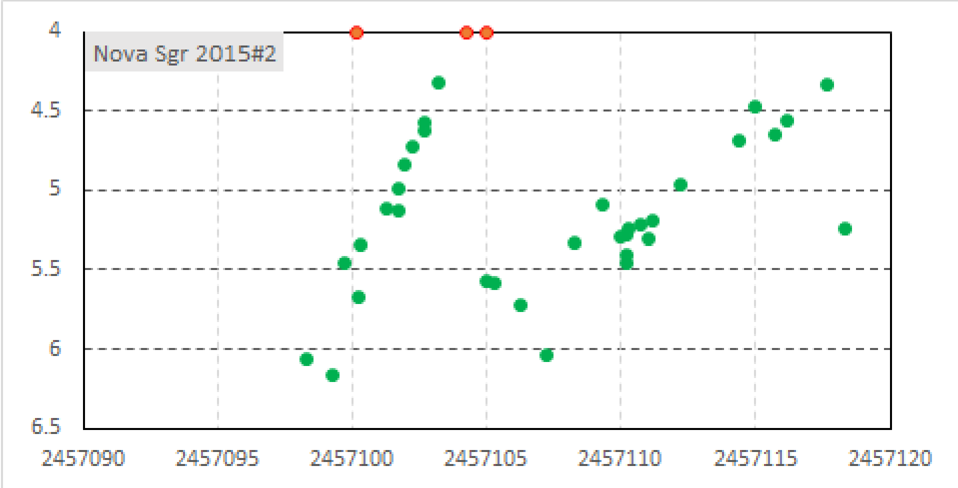


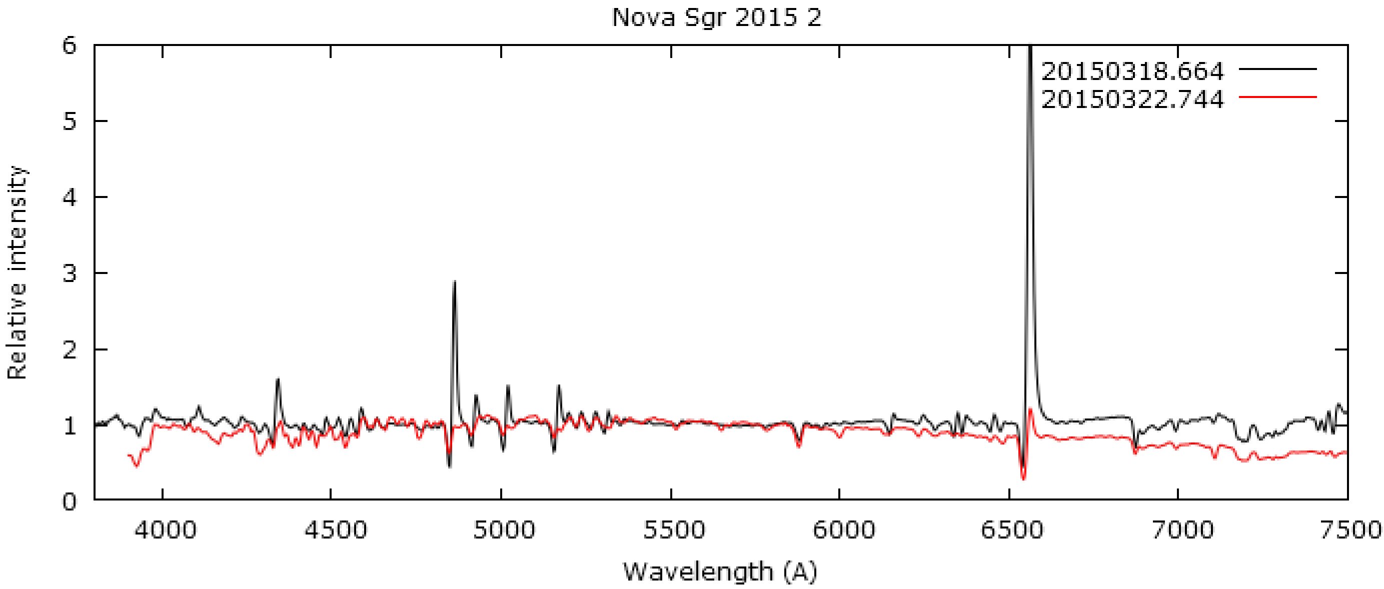
Nova Sgr#2 2015 (= PNV J18365700-2855420)

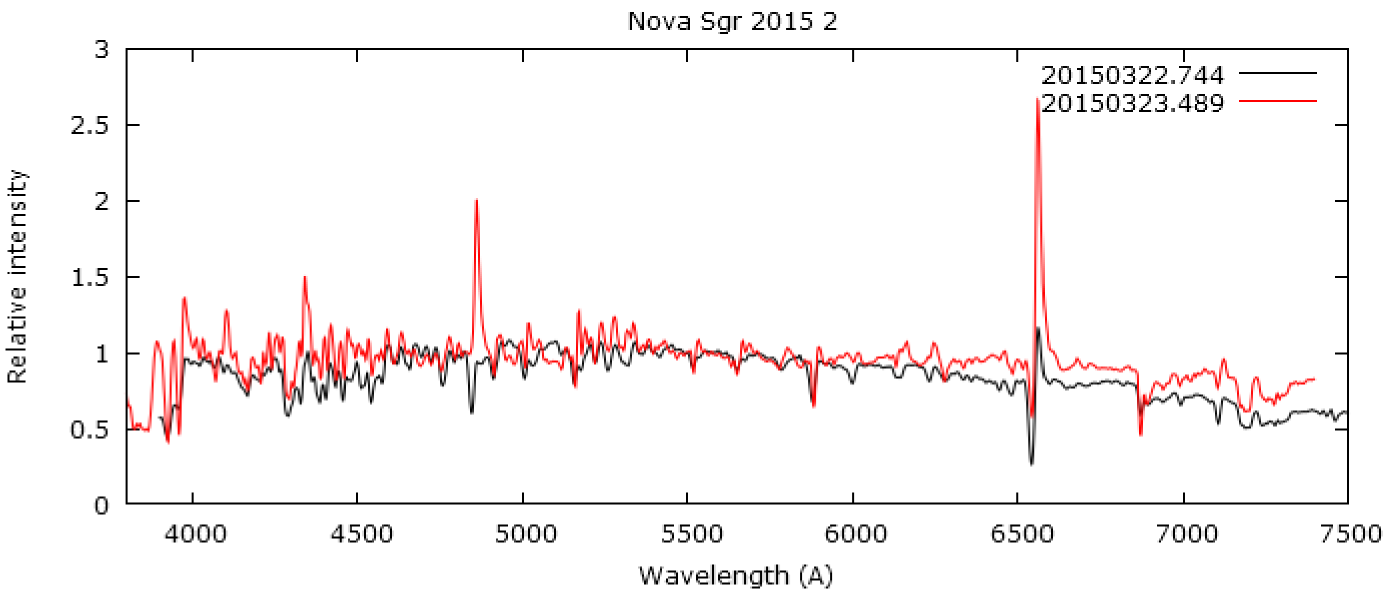
Transition from optically thick to thin conditions in the visual from spectra obtained by J. Powles and J. Edlin

In the spectrum of 22th of march (J. Powles), only Ha remains in emission among the Balmer lines.

Jim Edlin's spectrum (23-03) shows the rebrightning of the lines, less that one day after

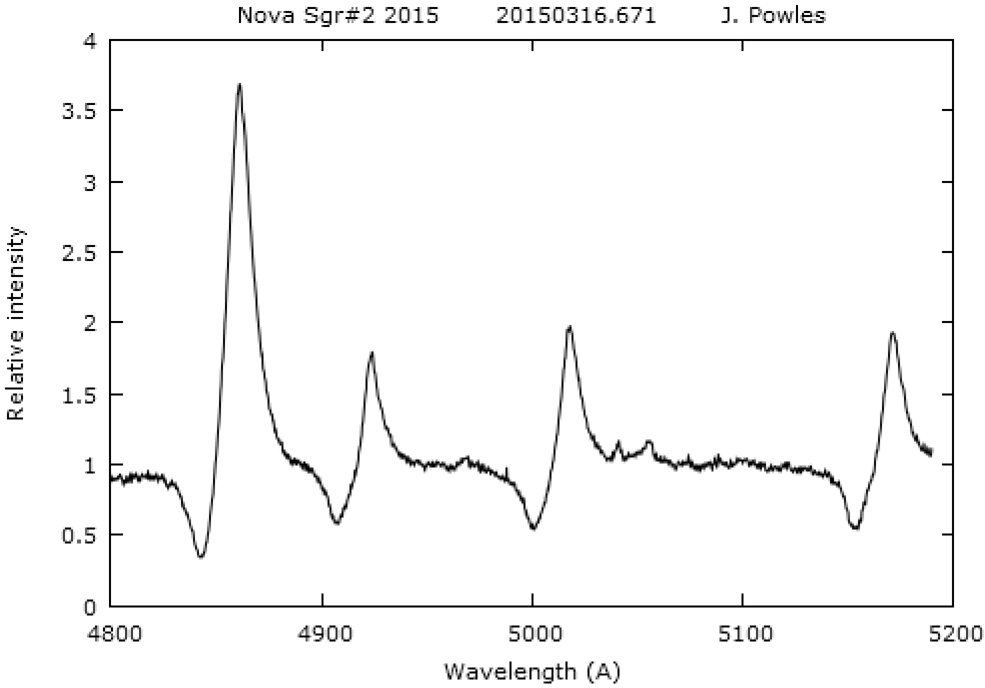






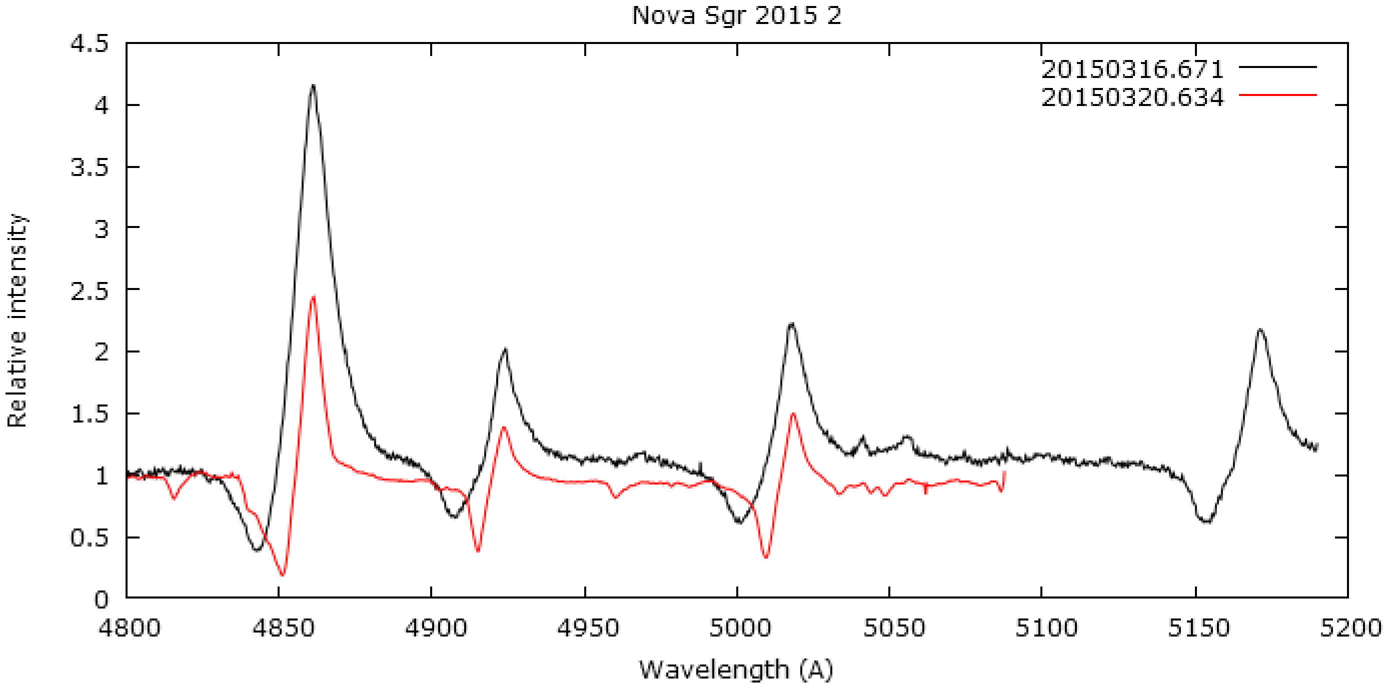
Nova Sgr#2 2015 (= PNV J18365700-2855420)

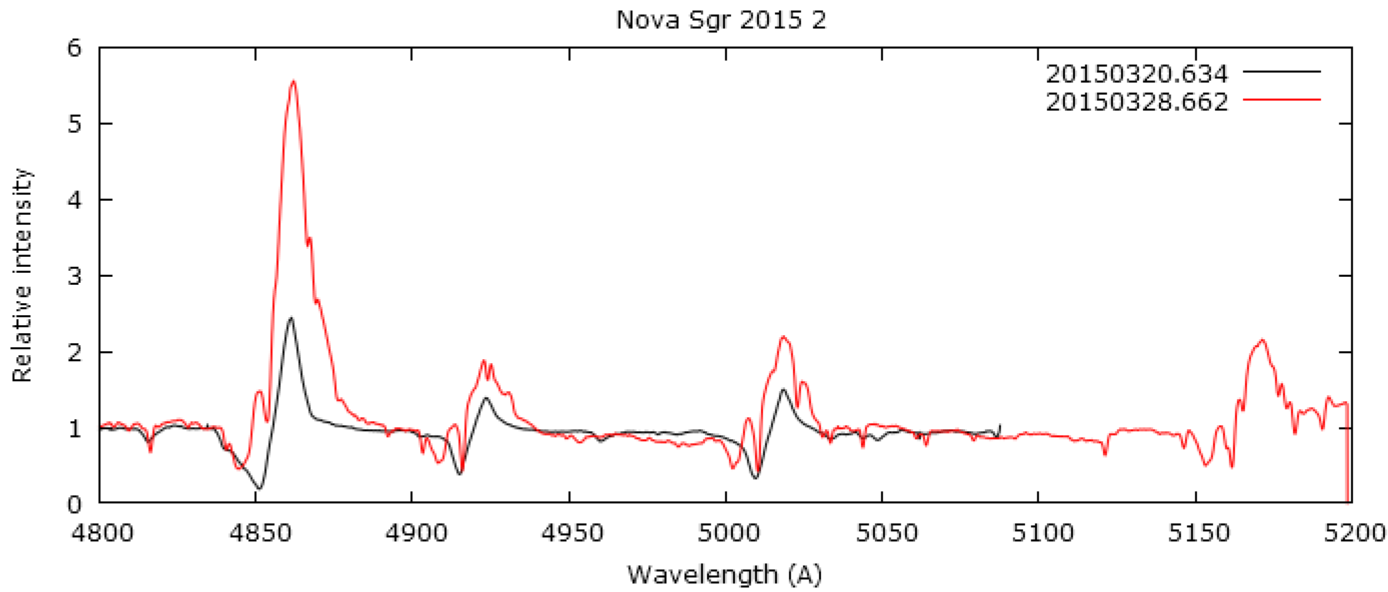
Hβ and Fe(42) multiplet
(λ = 4924, 5018, 5169)
J. Powles L-200 1800 l/mm

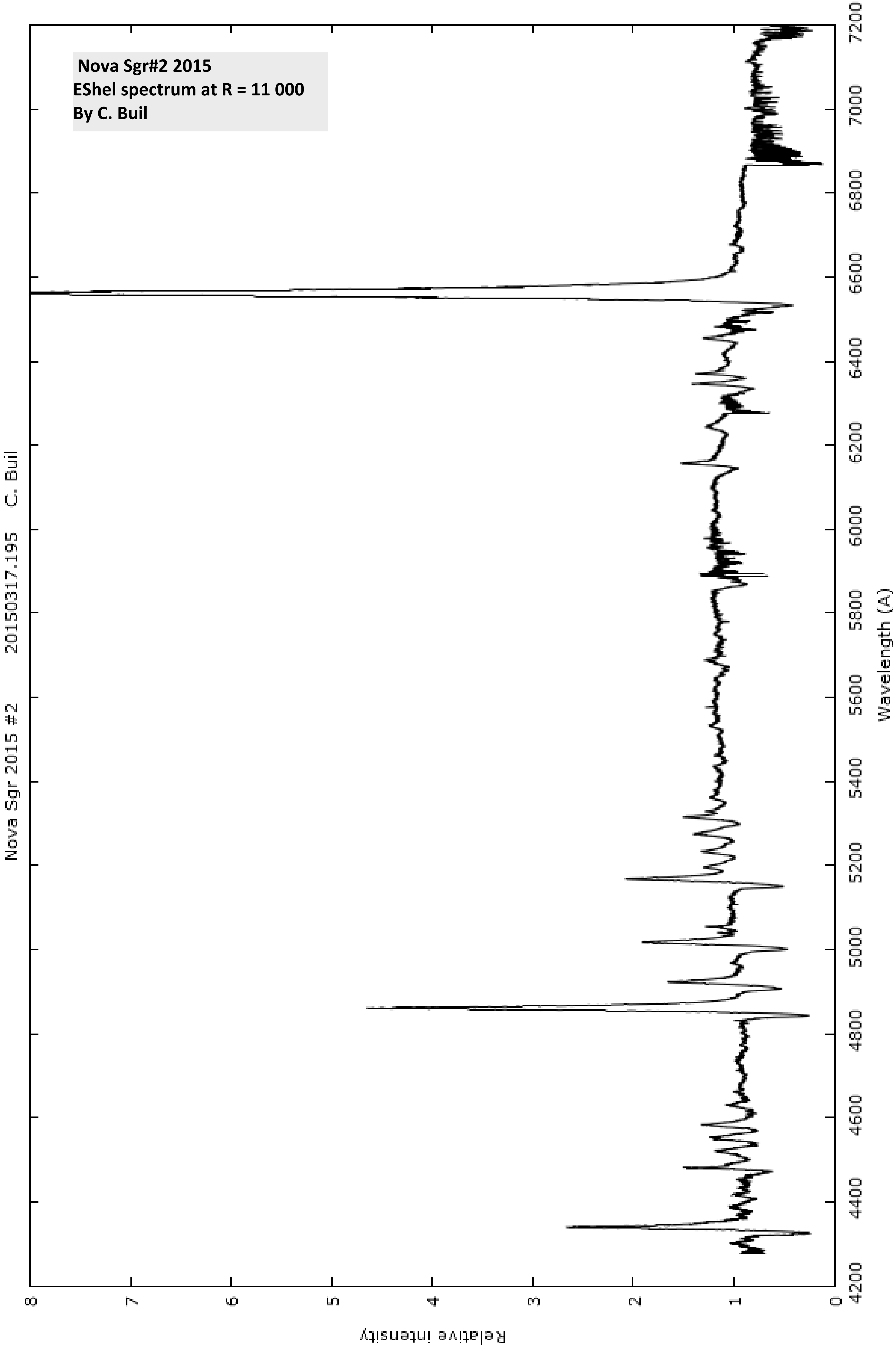


Evolution of H beta and Fe II (42) lines
2015-03-16 : J. Powles
2015-03-20 : M. Locke
2015-03-28 : J. Powles

See the complex absorptions in the spectrum of 28th of march (both in blue and red edges of the lines)

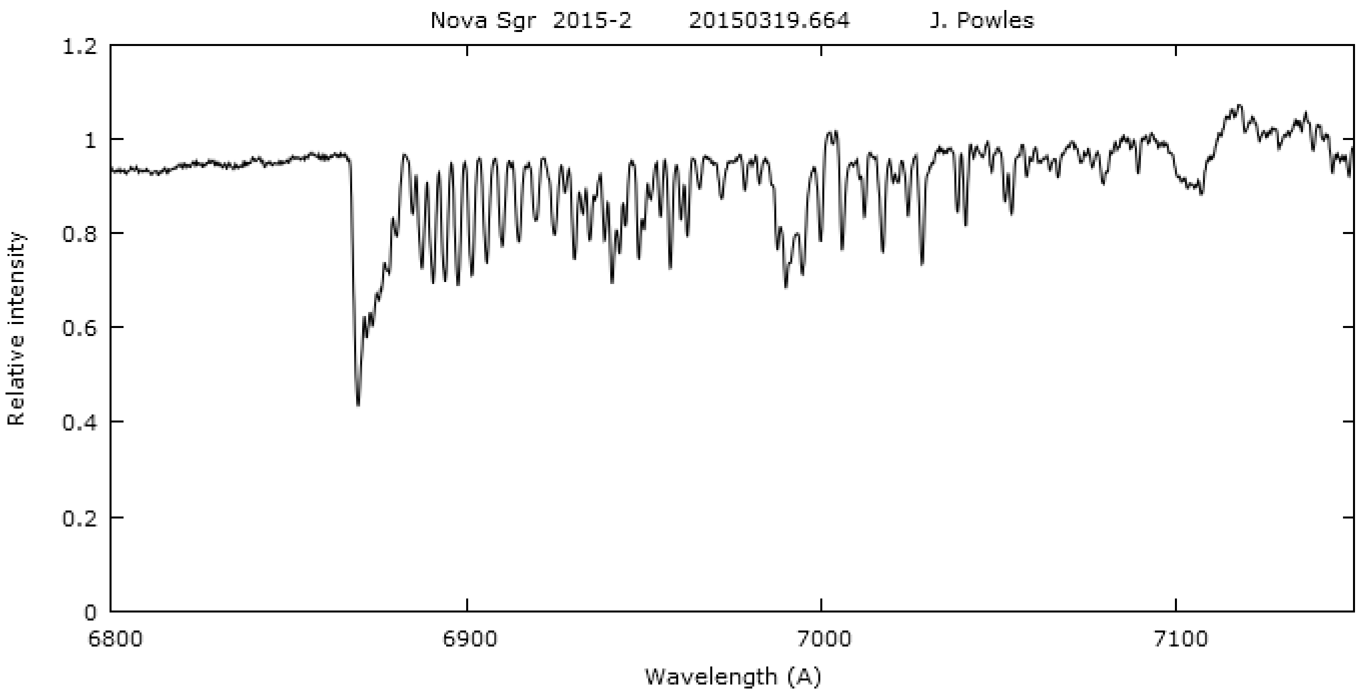





Nova Sgr#2 2015
EShel spectrum at R = 11 000
By C. Buil
Nova Sgr 2015 #2
20150317.195
C. Buil
Wavelength (A)
Relative intensity

The C I 7115 line appears to be present in the latest spectrum,, as it was rather early in V339 Del. There's still more to develop, i would be very important if the region from 6800 - 7200 A were well covered (the echelle data is superb). The maximum velocity and line profiles (and the current absence of [O I]6300, 6364) all point to a relatively normal, likely nearly spherical outburst with likely maximum velocity of -2500 to -3000 km/s (were we to see the absorption in P Cyg on the resonance lines). There aren't spectra extending to O I 8446 so I can't say whether O I 1302 is optically thick but the presence of strong Fe II 5018,5169 (nearly identical profiles but with some structure indicating the beginning of the first transition in the absorption) and Na I 5889,5895 in emission (and with P Cyg at about the "normal" velocity of -600 km/s) all are very much like V339 Del during the first two weeks of the outburst.

Steve Shore, 19-03-2015



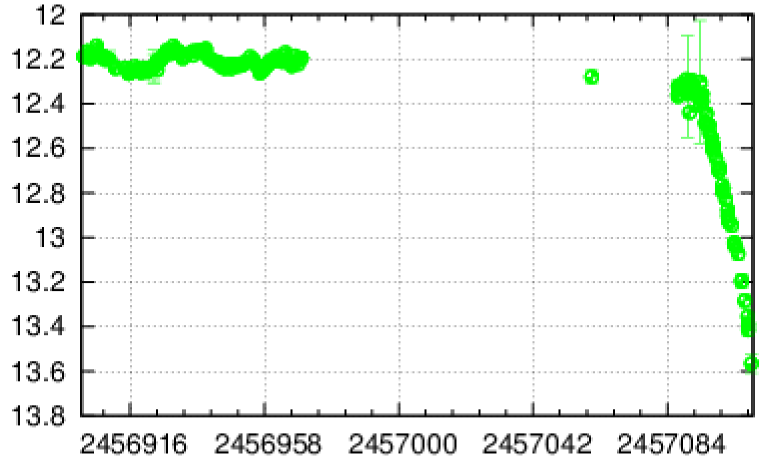
Comments from Jonathan Powles about its spectrum

The OI line at 7003 and the CI line complex at 7115 are clearly visible, although the 7003 line is obscured by the heavy telluric lines. I've had a go at removing them, using the H2O tool in vspec and using the spectrum of the reference star I'm using (Phi Sgr). The telluric-corrected spectrum is offset below, with a Gaussian filter applied to remove the artifacts.

ARAS Data Base : http://www.astrosurf.com/aras/Aras_DataBase/Novae/Nova-Sgr2-2015.htm

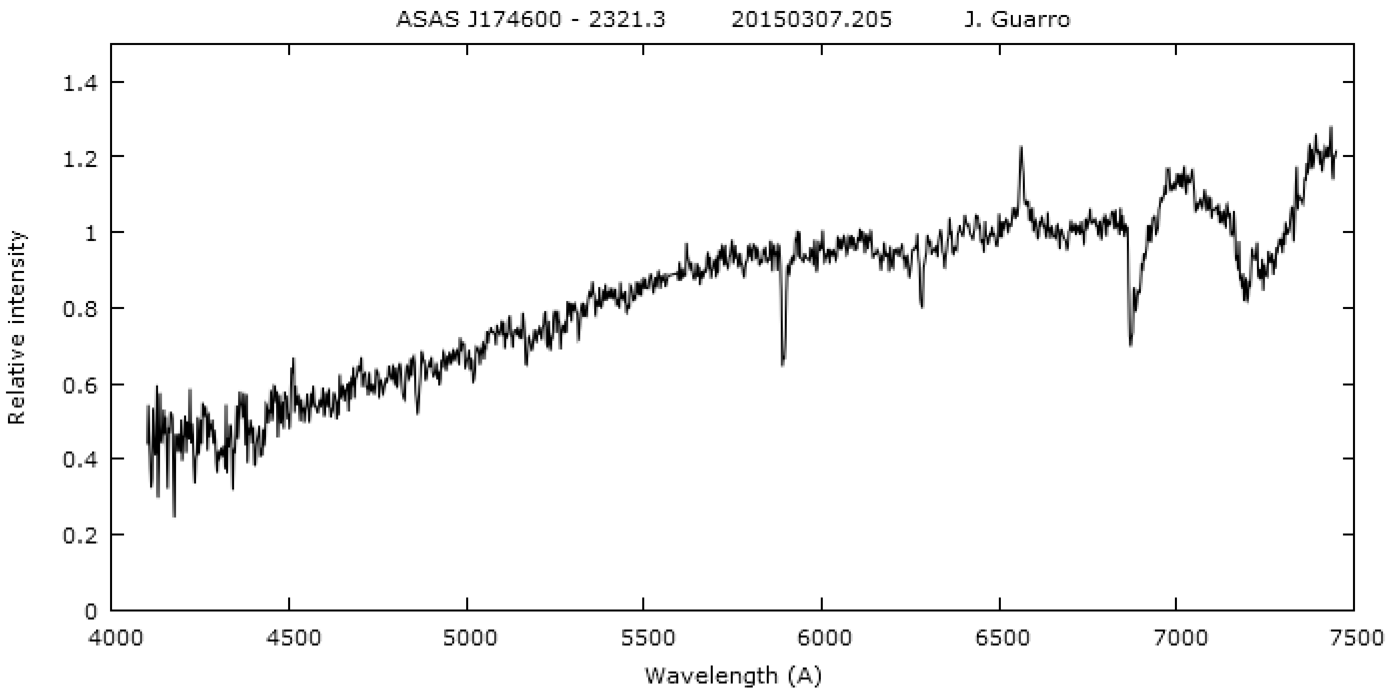
Symbiotic nova ASAS J174600-2321.3

Coordinates (2000.0)	
R.A.	17 46 00.18
Dec.	-23 21 16.4



See
Information letter #13
And
AAVSO Alert
http://www.aavso.org/aavso-alert-notice-510

Joan Guarro obtained a spectrum just before the begining of the deep eclipse



ARAS Data Base : http://www.astrosurf.com/aras/Aras_DataBase/Novae/Nova-Sgr2-2015.htm

Selected list of bright symbiotics stars of interest

Target						Refrence Star					
#	Name	AD (2000)	DE (2000)	Mag V *	Interest	Name	AD (2000)	DE (2000)	Mag V	E(B-V)	Sp Type
1	AX Per	1 36 22.7	54 15 2.5	11.6	++	HD 6961	01 11 06.2	+ 55 08 59.6	4.33	0	A7V
2	UV Aur	5 21 48.8	32 30 43.1	10		HD 39357	05 53 19.6	+ 27 36 44.1	4.557		A0V
3	ZZ CMi	7 24 13.9	8 53 51.7	10.2		HD 61887	07 41 35.2	+ 03 37 29.2	5.955		A0V
4	BX Mon	7 25 24	-3 36 0	10.4	+	HD 55185	07 11 51.9	- 00 29 34.0	4.15		A2V
5	V694 Mon	7 25 51.2	-7 44 8	10.5	++	HD 55185	07 11 51.9	- 00 29 34.0	4.15		A2V
6	NQ Gem	7 31 54.5	24 30 12.5	8.2		HD 64145	07 53 29.8	+ 26 45 56.8	4.977		A3V
7	T CrB	15 59 30.1	25 55 12.6	10.4	++	HD 143894	16 02 17.7	+ 22 48 16.0	4.817	0	A3V
8	AG Dra	16 1 40.5	66 48 9.5	9.7	++	HD 145454	16 06 19.7	+ 67 48 36.5	5.439	0	A0Vn
9	RS Oph	17 50 13.2	-6 42 28.4	10.4	++	HD 164577	18 01 45.2	+ 01 18 18.3	4.439	0	A2Vn
10	YY Her	18 14 34.3	20 59 20	12.9	++	HD 166014	18 07 32.6	+ 28 45 45.0	3.837	0.02	B9.5V
11	V443 Her	18 22 8.4	23 27 20	11.3	++	HD 171623	18 35 12.6	+ 18 12 12.3	5.79	0	A0Vn
12	BF Cyg	19 23 53.4	29 40 25.1	10.8	++	HD 180317	19 15 17.4	+ 21 13 55.6	5.654	0	A4V
13	CH Cyg	19 24 33	50 14 29.1	7	+	HD 184006	19 29 42.4	+ 51 43 47.2	3.769	0	A5V
14	CI Cyg	19 50 11.8	35 41 3.2	10.5	++	HD 187235	19 47 27.8	+ 38 24 27.4	5.826	0.02	B8Vn
15	StHA 190	21 41 44.8	2 43 54.4	10.3	+	HD 207203	21 47 14.0	+ 02 41 10.0	5.631	0	A1V
16	AG Peg	21 51 1.9	12 37 29.4	8.6	++	HD 208565	21 56 56.4	+ 12 04 35.4	5.544	0	A2Vnn
18	Z And	23 33 39.5	48 49 5.4	9.65	++	HD 222439	23 40 24.5	+ 44 20 02.2	4.137	0	A0V
19	R Aqr	23 43 49.4	-15 17 4.2	9.9	++	HD 222847	23 44 12.1	- 18 16 37.0	5.235	0	B9V

Mag V * : 01-04-2014

Symbiotic stars

observed in March, 2015

Star	Nb. spectra
AG Dra	4
AX Per	1
BD Cam	1
BF Cyg	2
BX Mon	2
CI Cyg	2
CH Cyg	9
NQ Gem	1
T CrB	2
Tx CVn	1
V443 Her	1
V694 Mon	13
ZZ CMi	2

Observing

CH Cygni campaign
Especially high resolution H alpha

BF Cygni
(High resolution of H alpha)

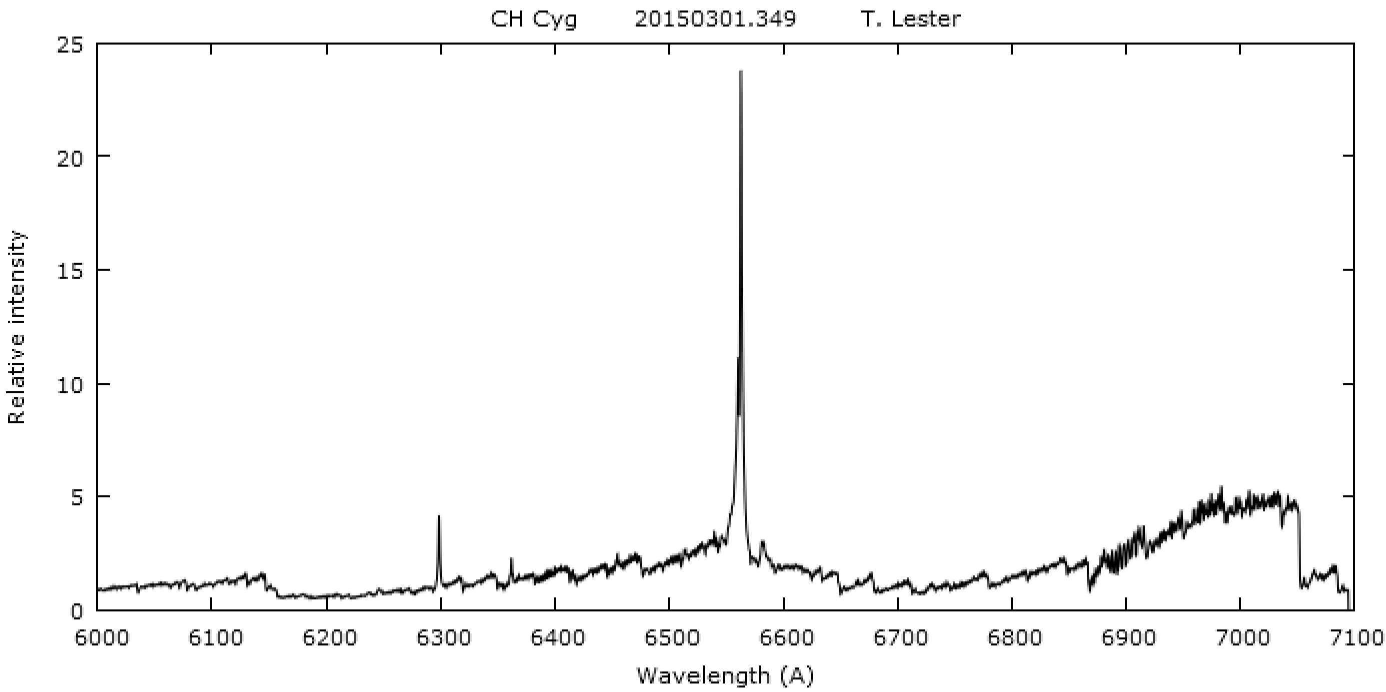
In the morning sky :
AG Dra
T CrB
YY Her
V443 Her
CI Cyg

CH Cygni campaign

Coordinates (2000.0)	
R.A.	**19 24 33.0**
Dec.	**+50 14 29.1**

The campaign is focused on Ha variations at R = 10 000
Low resolution spectra are also useful

Note that high resolution spectra should be corrected for heliocentric velocity



ARAS DATA BASE | http://www.astrosurf.com/aras/Aras_DataBase/Symbiotics/CHCyg.htm

CH Cygni campaign

A comment on the recent evolution in the line spectrum of CH Cygni

By Augustin Skopal

The line spectrum of CH Cyg is now characterized with lines of low ionized elements, as it is typical for active phases of this system.
Numerous FeII lines in emission (e.g. at ~ 4507, 4515, 4520, 4522, 4583, 4629, 4922, 5018 A) are clearly seen, TiII lines have a broad emission profile with an absorption cut off around its centre (e.g. at ~ 4395, 4444, 4468, 4501, 4533, 4563, 4571 A) and HeI emissions at 4471, 4713, 5015 (blended with FeII 5018 A), 5876 (with a shallow absorption extending to ~ -750 km/s), 6678 and 7065 A are also well recognizable. It is also worth to note the (nearly) permanent presence of [NII] lines at 6548 and 6583 A, seen also during quiescent phase, and the nebular [OIII] 4959 and 5007 A lines. It is of interest that all, [NII] 6583 and [OIII] nebular lines have a similar profile, being relatively broad with FWHM of ~ 170 km/s with a flat top, probably a result of a two-component blend. These lines suggest a bipolar structure of the nebula around CH Cyg - may be a result of a collimated bipolar outflow from the system.
However, the spectrum is dominated by the hydrogen lines of Balmer series. Figure 1 shows example of your recent observations
From March 12, 17 (Christian Buil's spectra) and 23 (Francois Teyssier's spectrum) compared with a spectrum from February 14, 2015, taken with our 0.6 m telescope in Tatranska Lomnica. As it can be seen from the figure, the development of a strong and broad absorption at the blue side of the H-alpha, H-beta and H-gamma line profiles, during less than one month, demonstrates a new abrupt mass ejection by CH Cyg. Note also that such the absorption component of the HeI 5876 A line has a comparable terminal velocity of 750-780 km/s.
Figure 1 also suggests that the absorption component is more pronounced in higher members of the Balmer series, H-gamma and H-beta. This is because transitions of these lines are fainter (less probable) than that producing the H-alpha line. As a result, in H-gamma and H-beta we can see geometrically deeper into the ejecting material in direction of the observer than in H-alpha, to reach the same optical depth. A deeper view generally means a higher density and thus more absorbing effects. However, more or less the same radial velocity displacement (with the same terminal velocity) of the absorbing medium on the line of sight, as indicated by the broad absorption components, implies that there is no evident velocity stratification in the ejected material. This thus suggests that the material was ejected rather as a bullet from the gun at a certain distance from the white dwarf (in maximum, from the pseudo-photosphere seen in the H-gamma line, but probably much closer to the accretor).
If this is really so, then we should observe an emission counterpart at the red side of the line core, assuming that the mass ejection is bi-conical, as appeared in the case of BF Cyg (see ATel #7258).
Its occurrence, however, depends on the orbital inclination - a less inclined disk-like formation around the white dwarf will eclipse the material moving from the observer for a longer time than in the case of a higher `i'. From this point of view, i(CH Cyg) < i(BF Cyg), that is also consistent with a smaller terminal velocity of the broad absorption of ~ -550 km/s as measured in the recent spectra of BF Cyg.
Unfortunately, there is no new observations from March 23 to support this hypothese. Fortunately, the development of accretion/ejection phenomena in symbiotic stars proceeds usually at time-scales of weeks to months, which allows us to study these still not well understood events in more detail than, for example, in the case of the violent and usually fast outbursts of classical novae. New observations should reveal what CH Cygni decided to do before around 250 years. Its light carryring this information is now approaching our Earth.
Good luck in catching it!

p.s.
The origin of the central sharp absorption in the hydrogen profiles, that ignores the dramatic rapid variation at its blue side, is another story.

CH Cygni campaign

A comment on the recent evolution in the line spectrum of CH Cygni

By Augustin Skopal

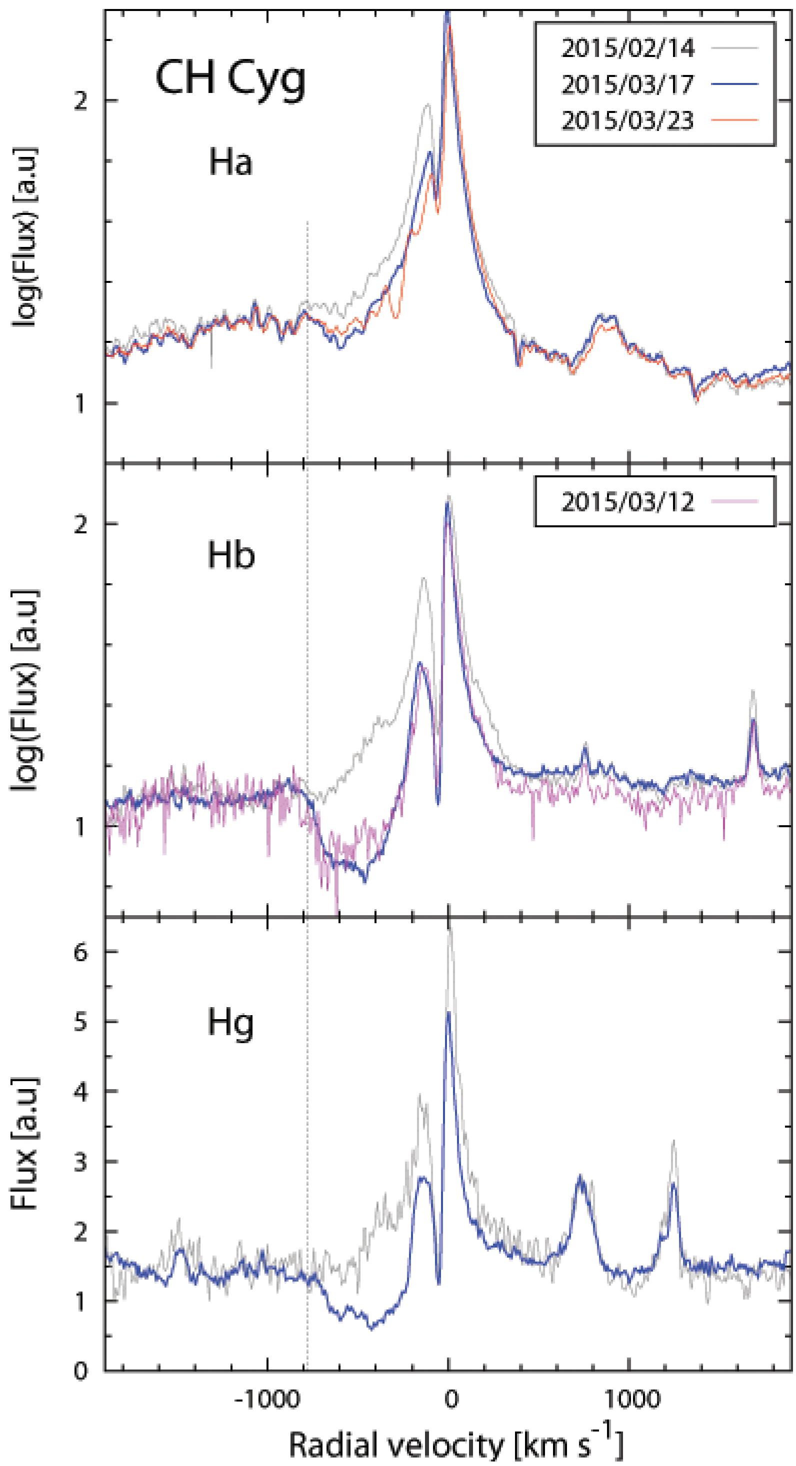
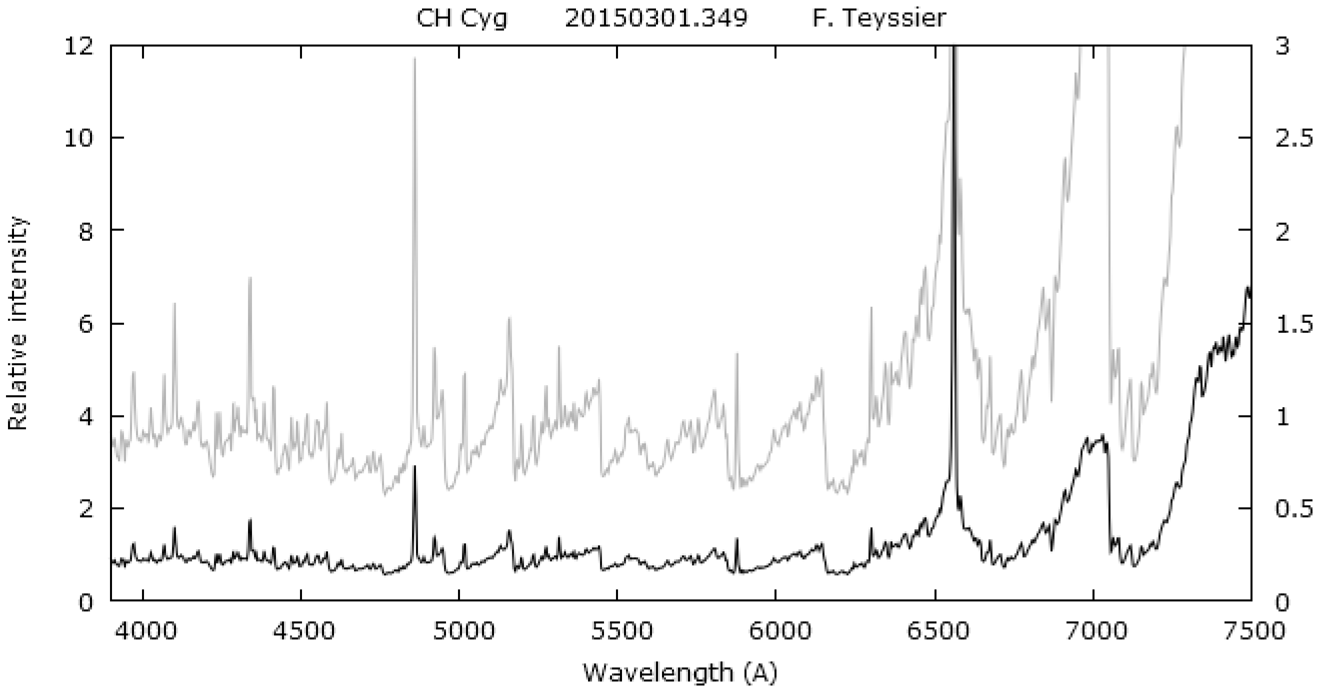
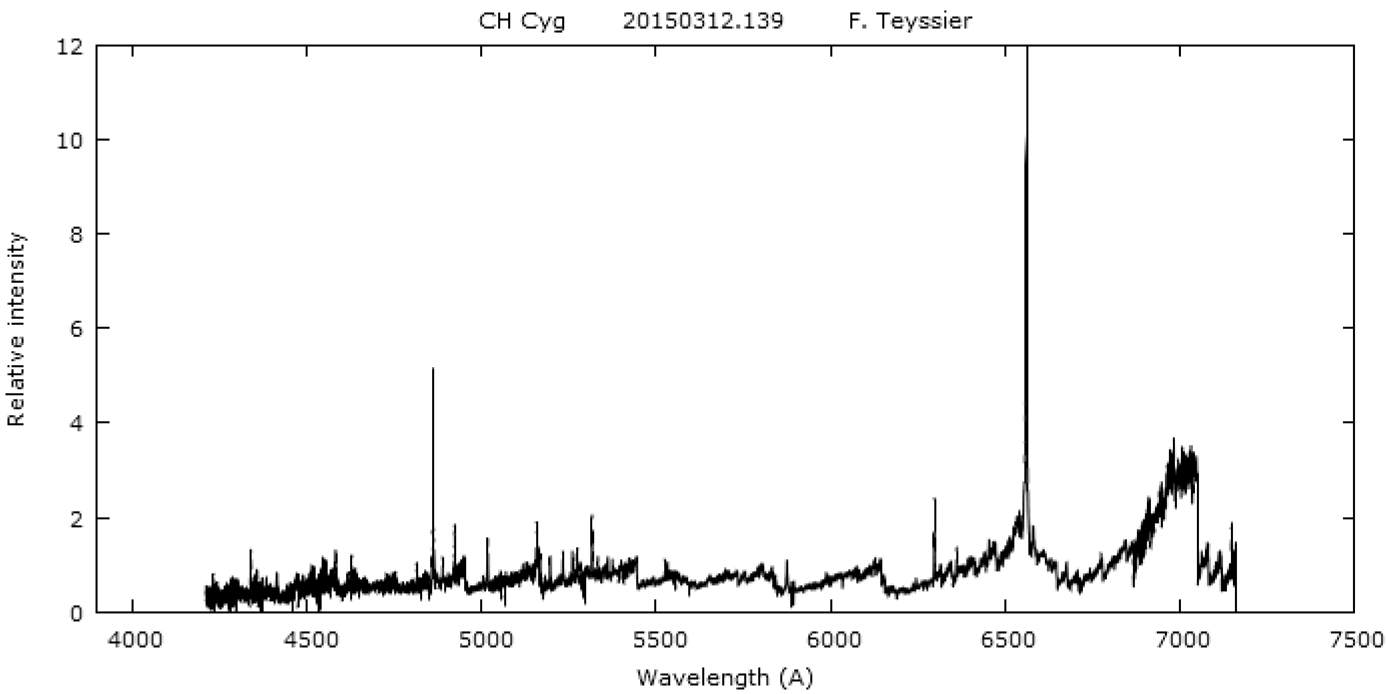


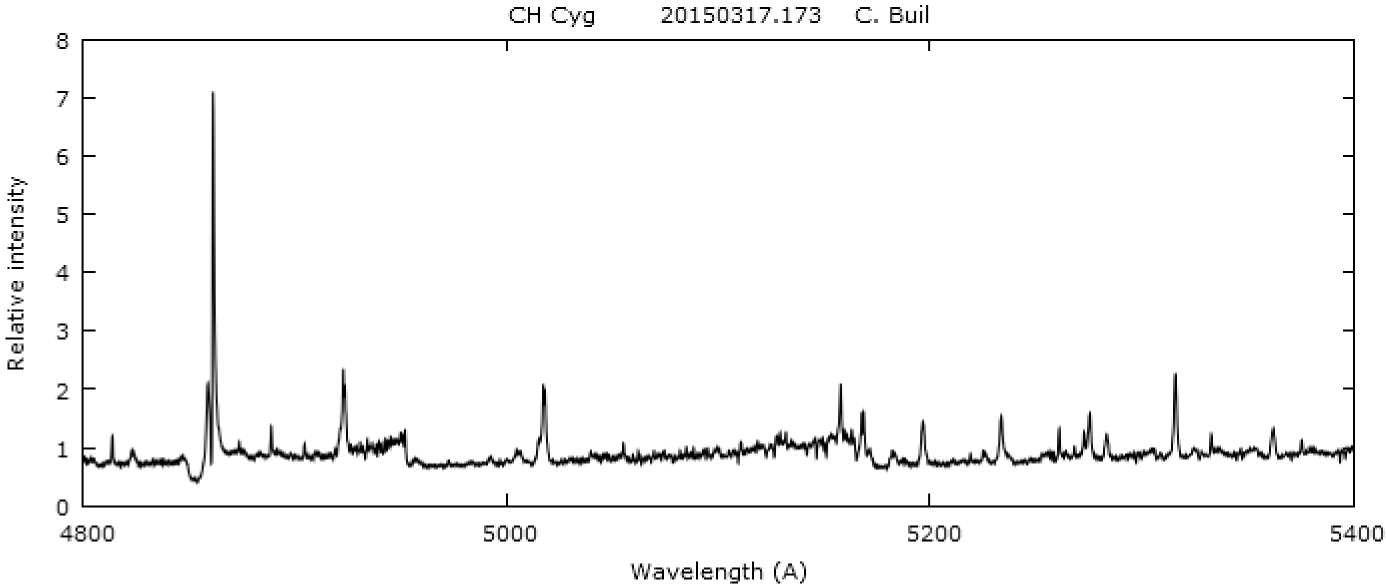
Figure 1.
Recent evolution of the H-alpha, H-beta and H-gamma line profiles in the spectrum of CH Cyg (R~11000). The magenta and blue lines represent spectra from March 12 and 17 made by Christian Buil and the red one is from March 23 as observed by Francois Teyssier.
Compared is the spectrum from February 14 (gray line) carried out by 0.6 m telescope of the Astronomical Institute in Tatranska Lomnica.
Vertical dotted line at -780 km/s

Coordinates (2000.0)	
R.A.	19 24 33.0
Dec.	+50 14 29.1

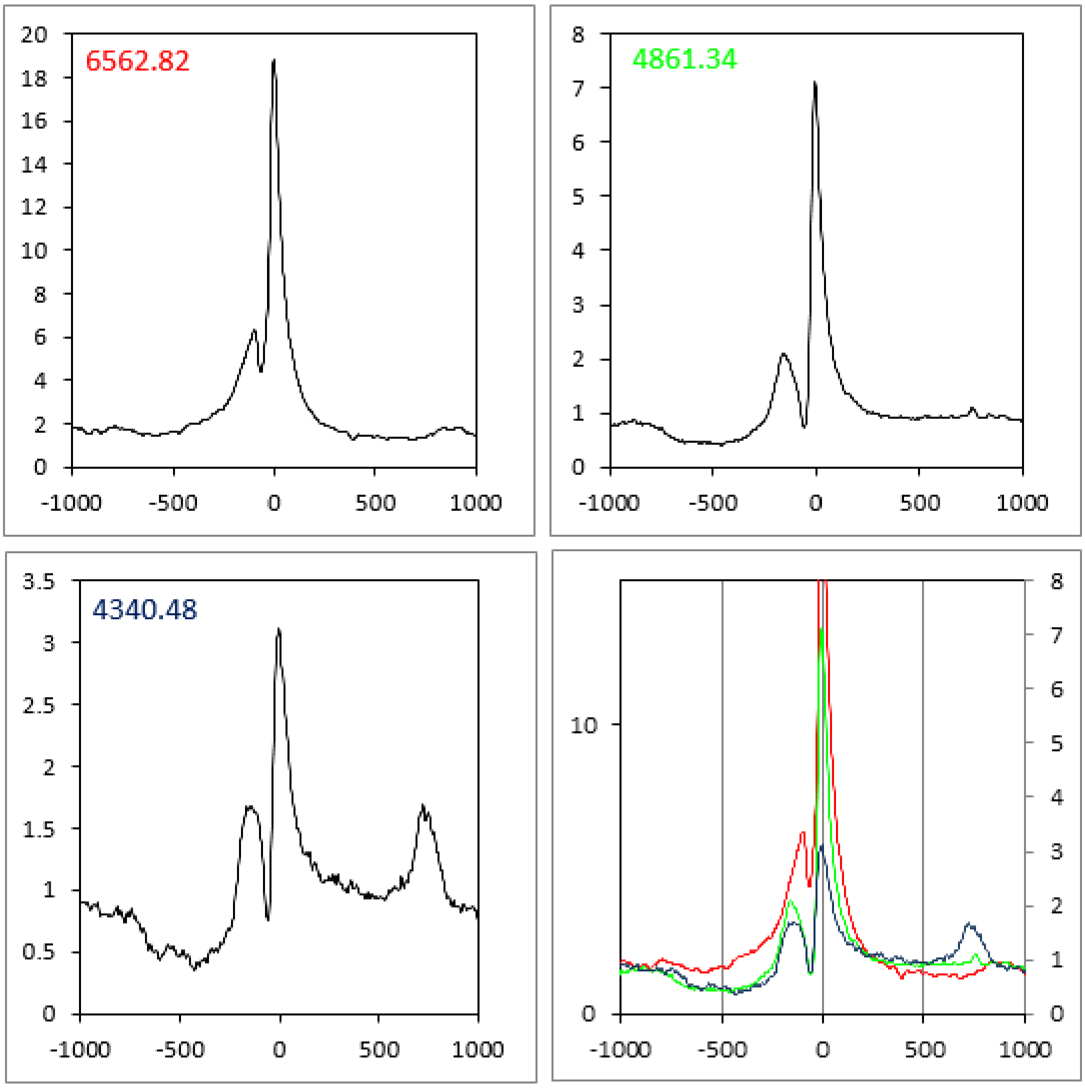
From LISA to eShel ...

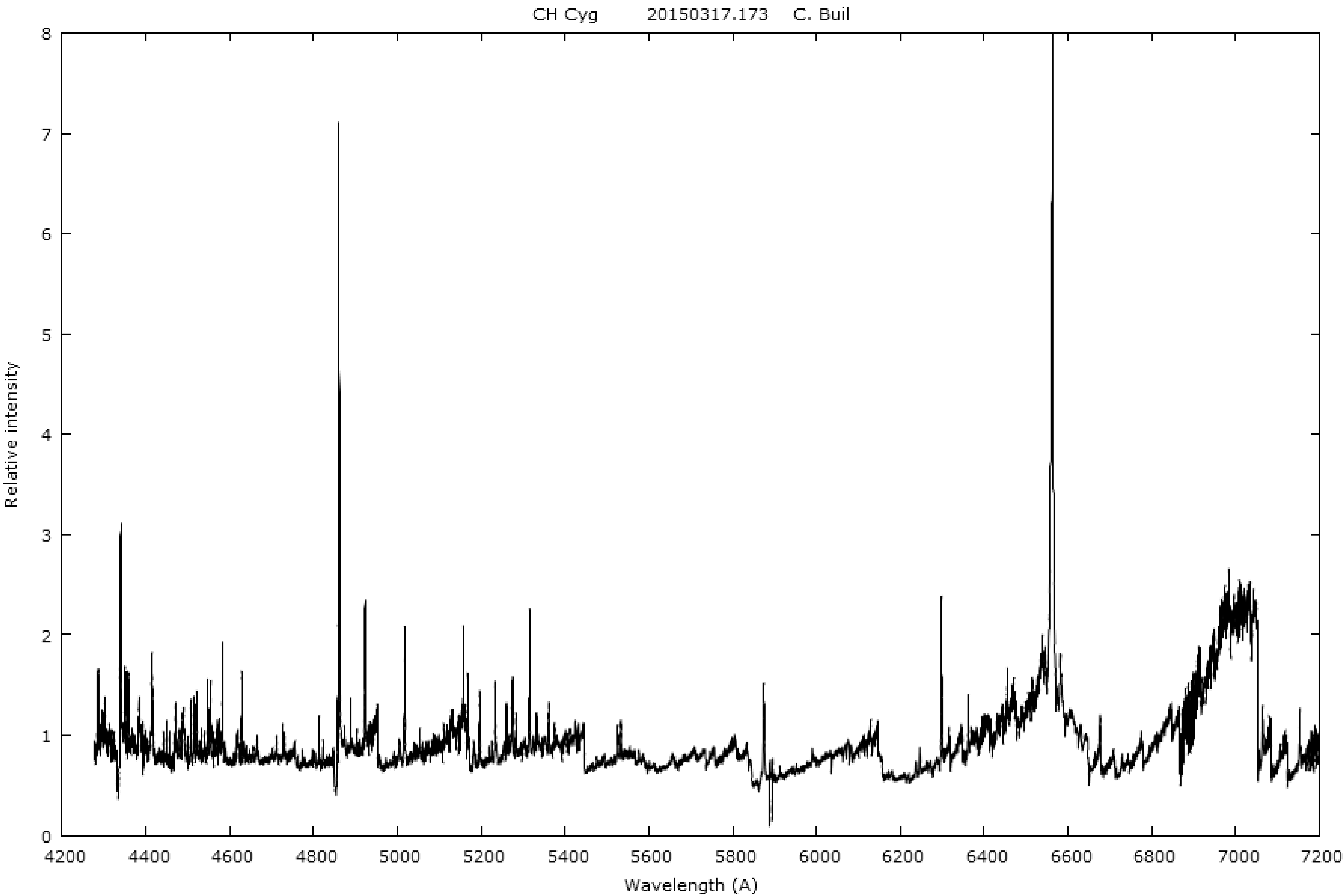






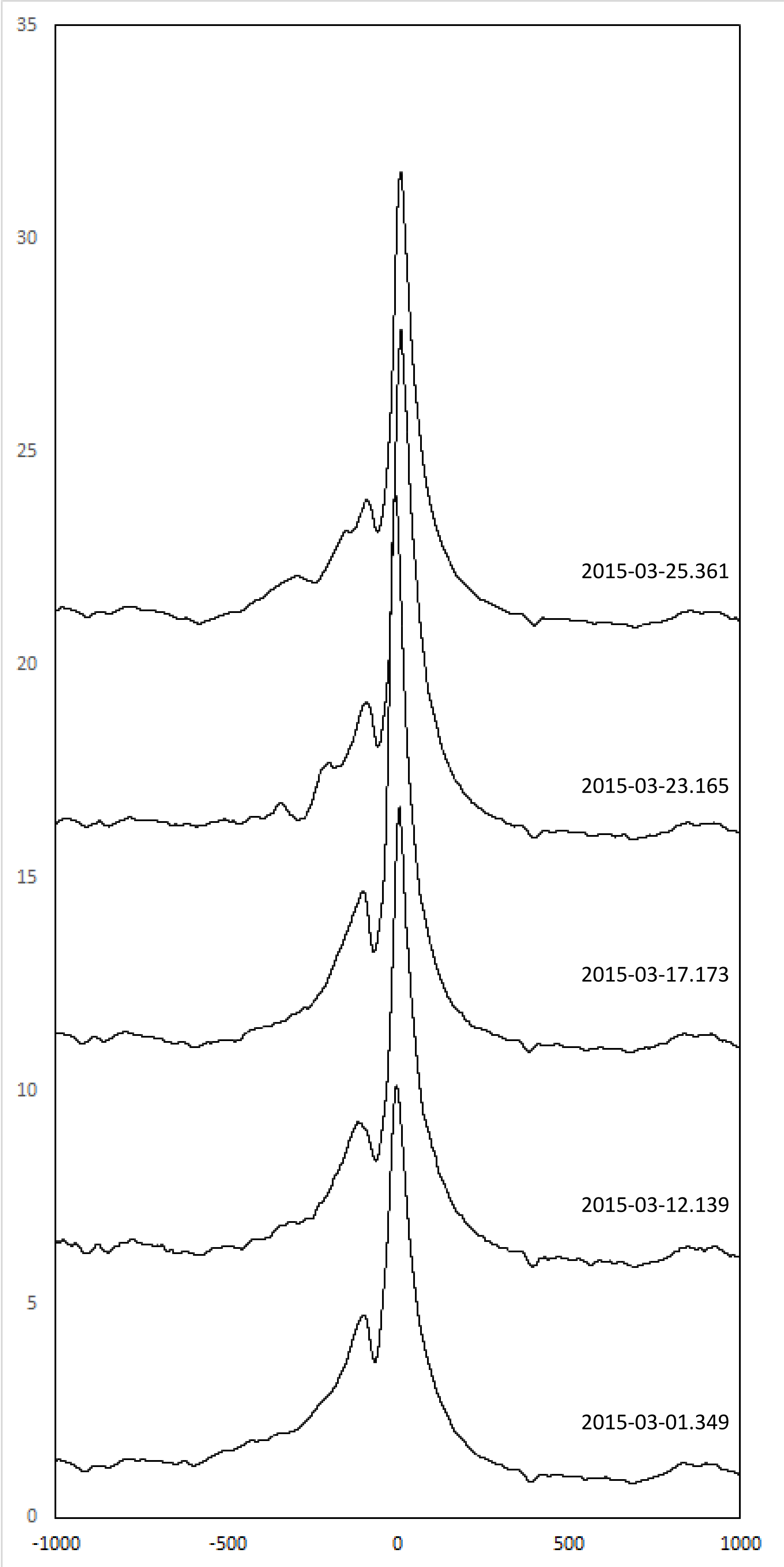
Balmer lines profiles
According to radial velocity
In km/s



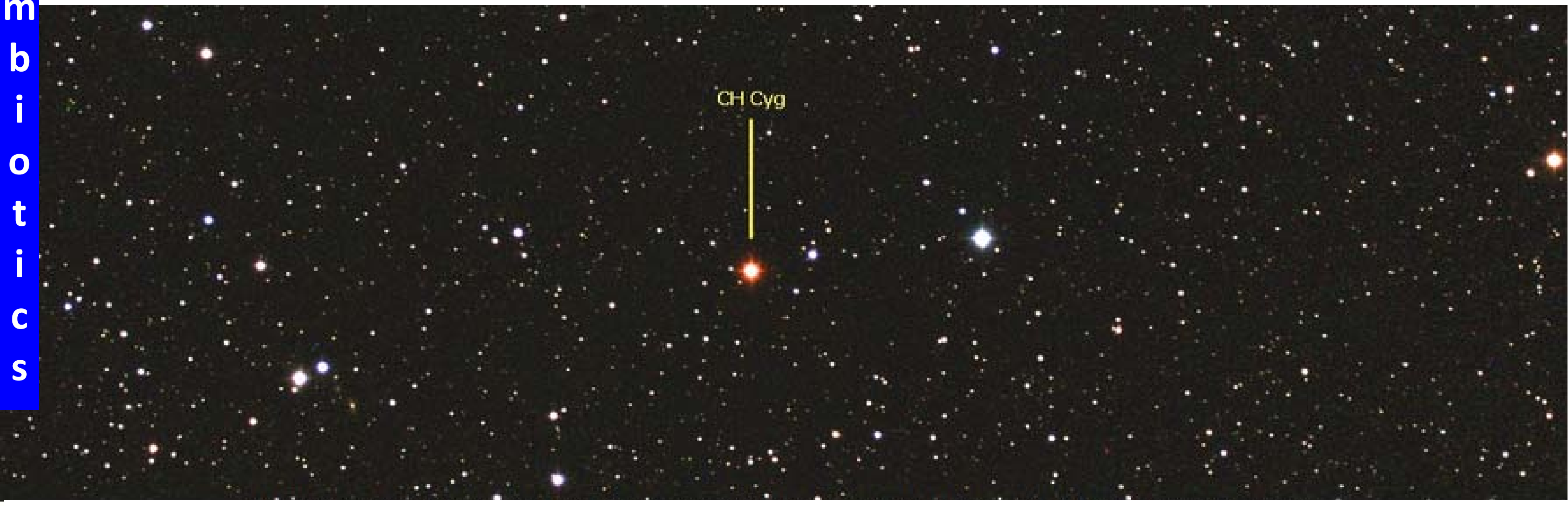

CH Cyg 20150317.173 C. Buil
Relative intensity
Wavelength (A)
0
1
2
3
4
5
6
7
8
4200
4400
4600
4800
5000
5200
5400
5600
5800
6000
6200
6400
6600
6800
7000
7200

H alpha profile
according to radial velocity (in km/s)
Spectra are corrected for heliocentric velocity)

01-03-2015 : T. Lester
12-03-2015 : F. Teyssier
17-03-2015 : C. Buil
23-03-2015 : F. Teyssier
25-03-2015 : T. Lester



Request for observations of the symbiotic star CH Cygni (Dr A. Skopal)



Field of CH Cygni - Christian Buil - 15-03-2012

CH Cygni

Coordinates (2000.0)	
R.A.	**19 24 33**
Dec.	**+54 14 29.1**

Current magnitude V = 7.4 to 7.6
(Flickering)

Reference stars

MILES Standart for high resolution spectra

Name	RA (2000)	Dec (20002)	Sp. Type	Mag. V	E_{B-V}
HD 192640	20:14:31.9	+36:48:22.7	A2V	4.96	0.026

Reference for low resolution spectra

Name	RA (2000)	Dec (20002)	Sp. Type	Mag. V	E_{B-V}
HD 183534	19:27:42	+52:19:14	A1V	5.7	0

Observing

High resolution spectra
Eshel
LHIRES III 2400 l/mm (H alpha)
Spectra should be corrected for heliocentric velocity

Send spectra

To francoismathieu.teyssier at bbox.fr

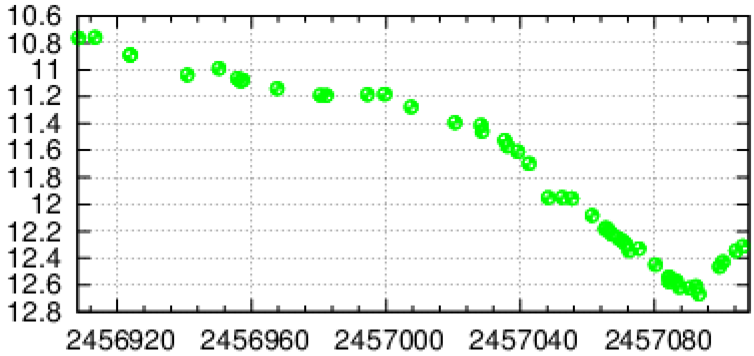
File name : _chcygni_aaaammdd_hhh.fit
And _chcygni_aaaammdd_hhh.zip for eShel

ARAS Data Base for CH Cygni
http://www.astrosurf.com/aras/Aras_DataBase/Symbiotics/CHCyg.htm
See also former campaign :
www.astrosurf.com/aras/surveys/chcyg/index.html

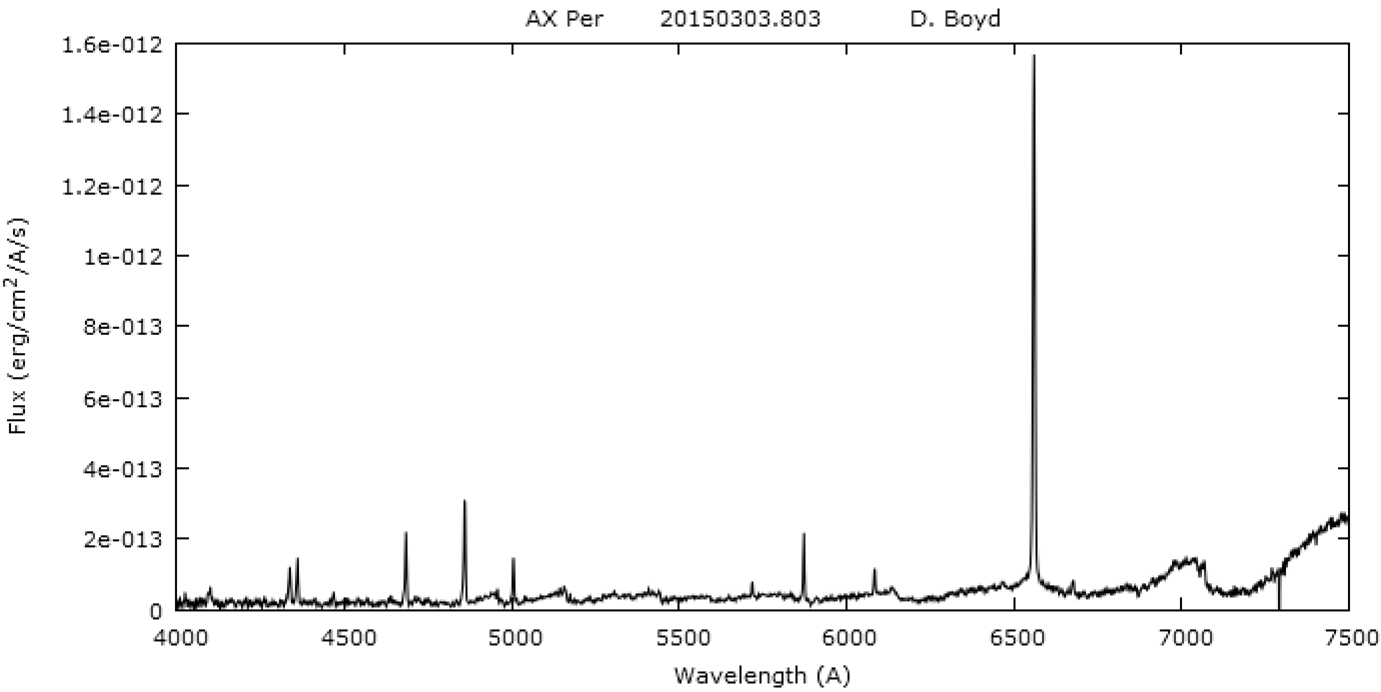
AX Per Outburst

AX Per is recovering from its eclipse. The maximum was on 8th of march (JD 2457087).

ARAS data base [Data Base AX Per]



Coordinates (2000.0)	
R.A.	01 h 36 m 22.7 s
Dec.	+54° 15' 2.5"

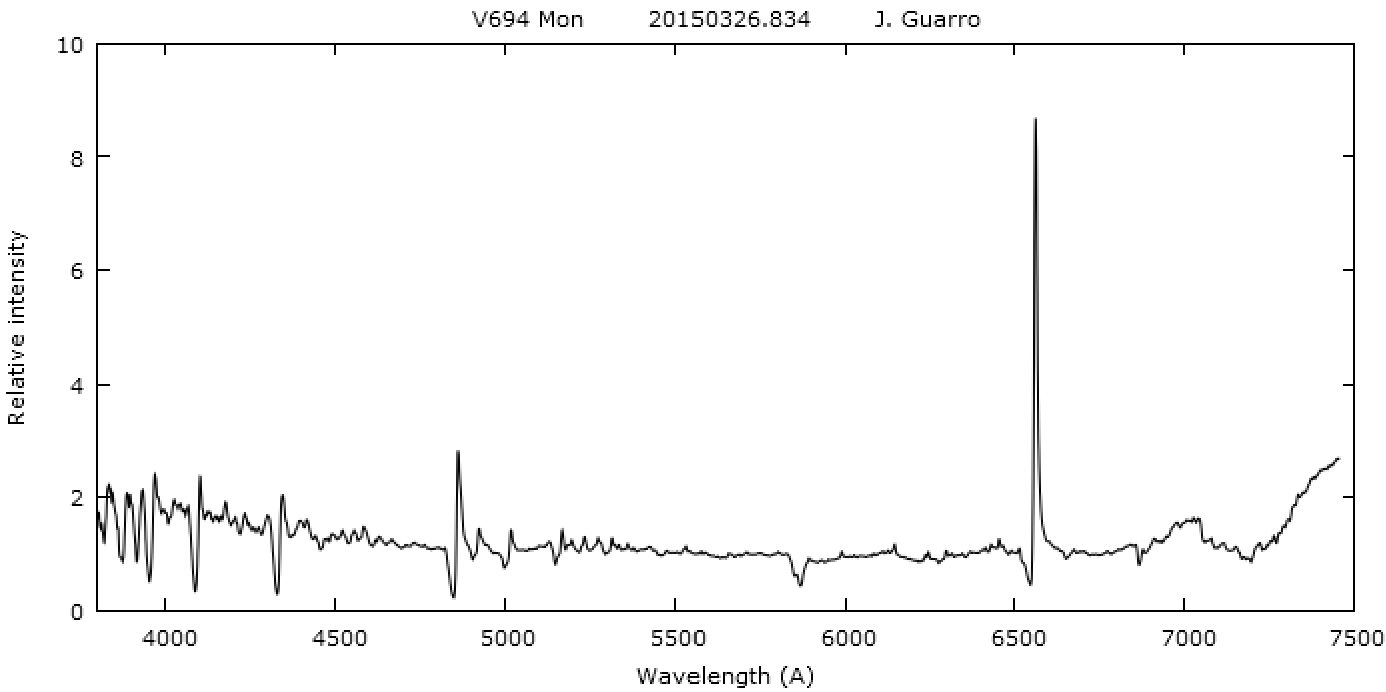


V694 Mon = MWC 560

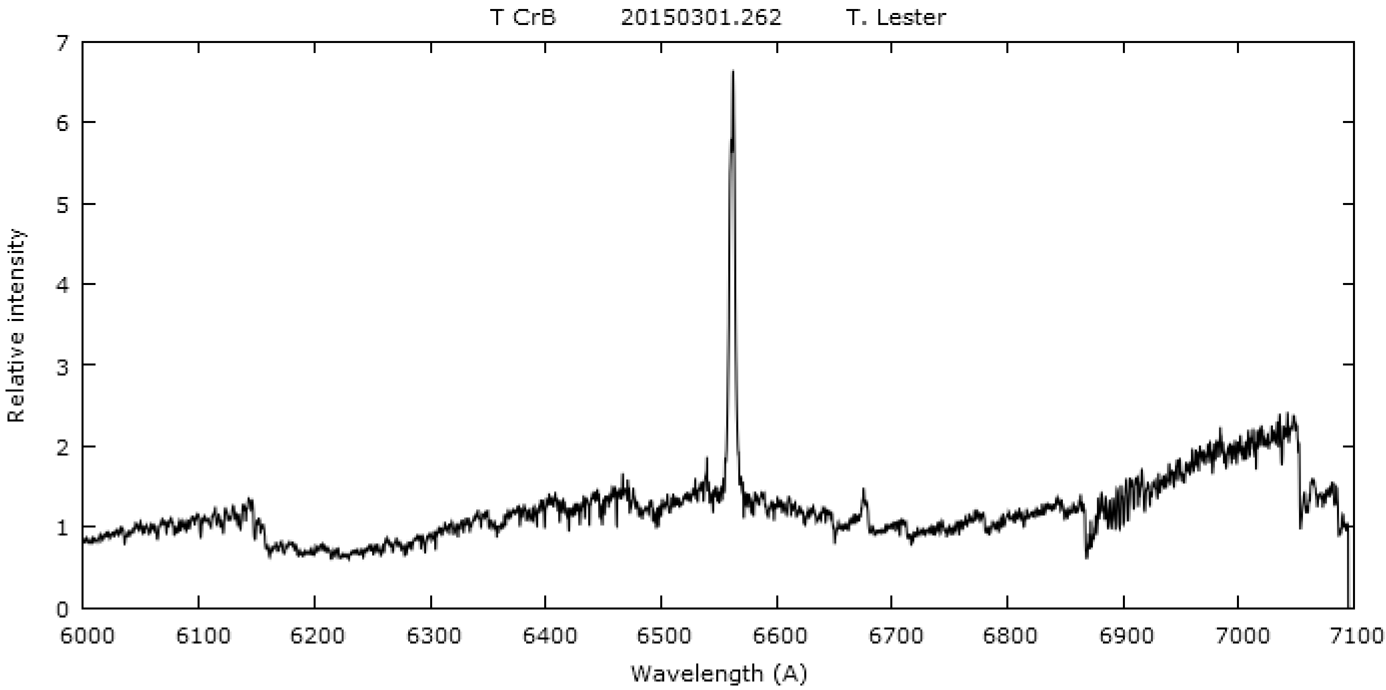
Coordinates (2000.0)	
R.A.	07 h 25 m 51.2 s
Dec.	-07° 44' 08"

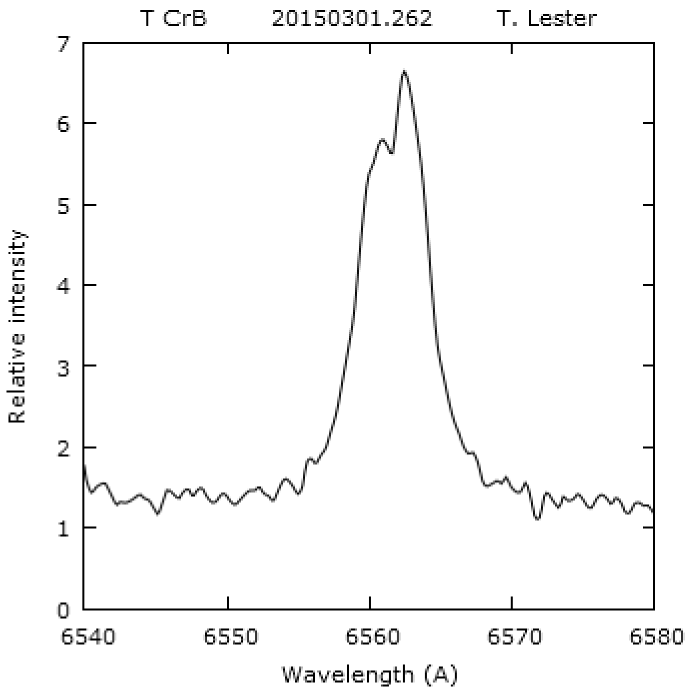
Spectroscopy :

35 spectra obtained from october,2014
to march 2015
To be analysed …



Coordinates (2000.0)	
R.A.	15 59 30.2
Dec.	+25 55 12.6





Coordinates (2000.0)	
R.A.	19 23 53.5
Dec.	+29 40 29.2

A short description of BF Cygni from Skopal & al. (2013)

BF Cyg is an eclipsing symbiotic binary comprising and M5 III giant and a white dwarf (WD) on a 757.2-d orbit . The historical light curve of BF Cyg is dominated by a symbiotic nova-like outburst, which occurred around 1895 with a slow decline to the pre-outburst magnitudes, for almost one century, and a number of Z And-type outbursts superposed on the nova-like profile (see Fig. 1 from Skopal & al. (1997)

The emission line spectrum is represented by the lines of low ionized elements (H I , He I , and neutral or singly ionized metals), whose profiles are often P Cyg-type. Their absorption component indicates a mass outflow at 100–200 to 500 km.s^{-1} from the hot star.

In December 2014/January 2015, Munari & al. detected a large flare with large changes in the spectrum (ATel # 7013)

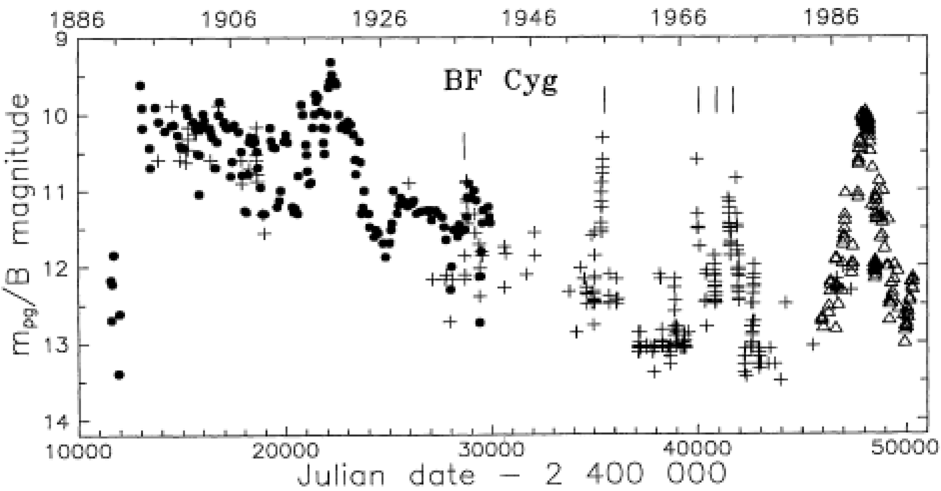
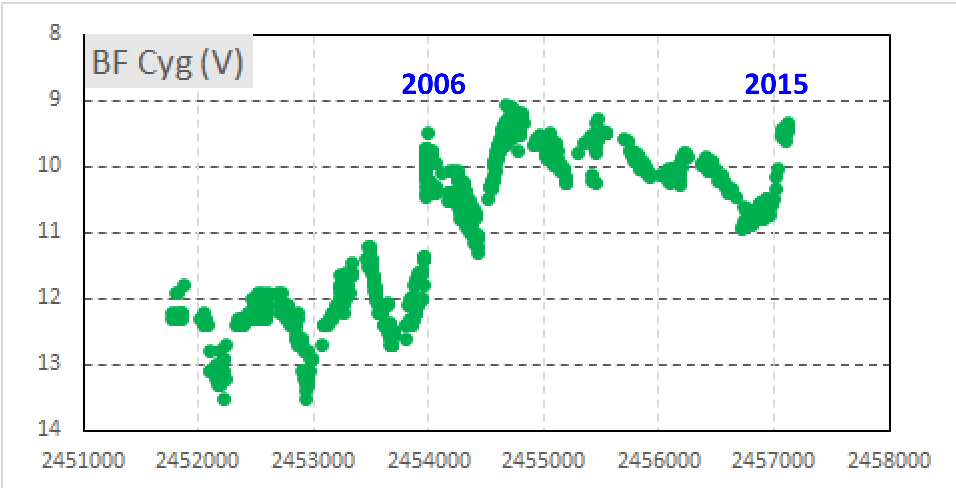


Fig.1 Historical light curve of BF Cygni, showing the nova event which occurred between 1892 and 1894 and the slow decline up to ~ 1965. From A. Skopal & al. (1997)

Fig. 2 In August 2006, BF Cyg erupted again (Munari & al., 2006, CBET 596) and remained around the maximum with modulations of the 757 days orbital period. The last flare appears late 2014.



AAVSO V band light curve since 2000

Multicolour photometry and Echelle spectroscopy of the symbiotic star BF Cyg during its 2014-15 large flare

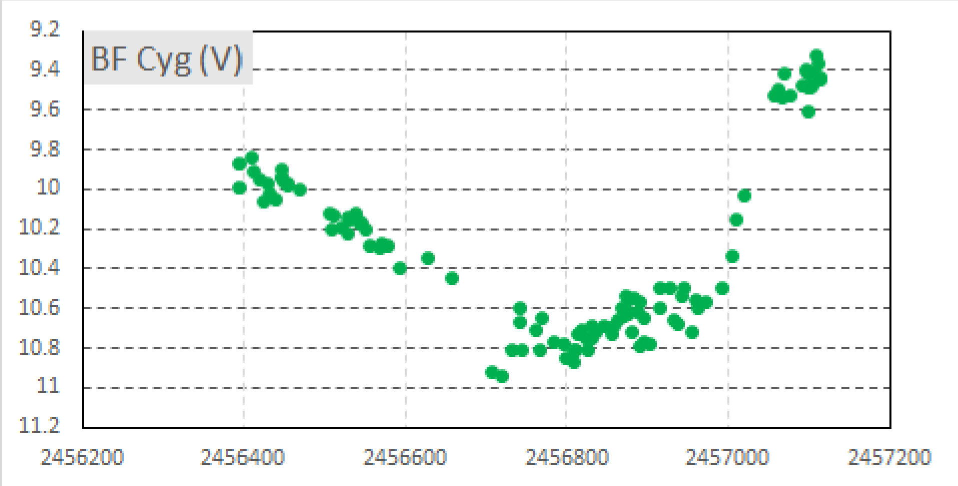
ATel #7258; A. Skopal, M. Sekeras, S. Shugarov, T. Pribulla, M. Vanko (Astronomical Institute, Slovak Academy of Sciences, Tatranska Lomnica) on 20 Mar 2015; 13:21 UT

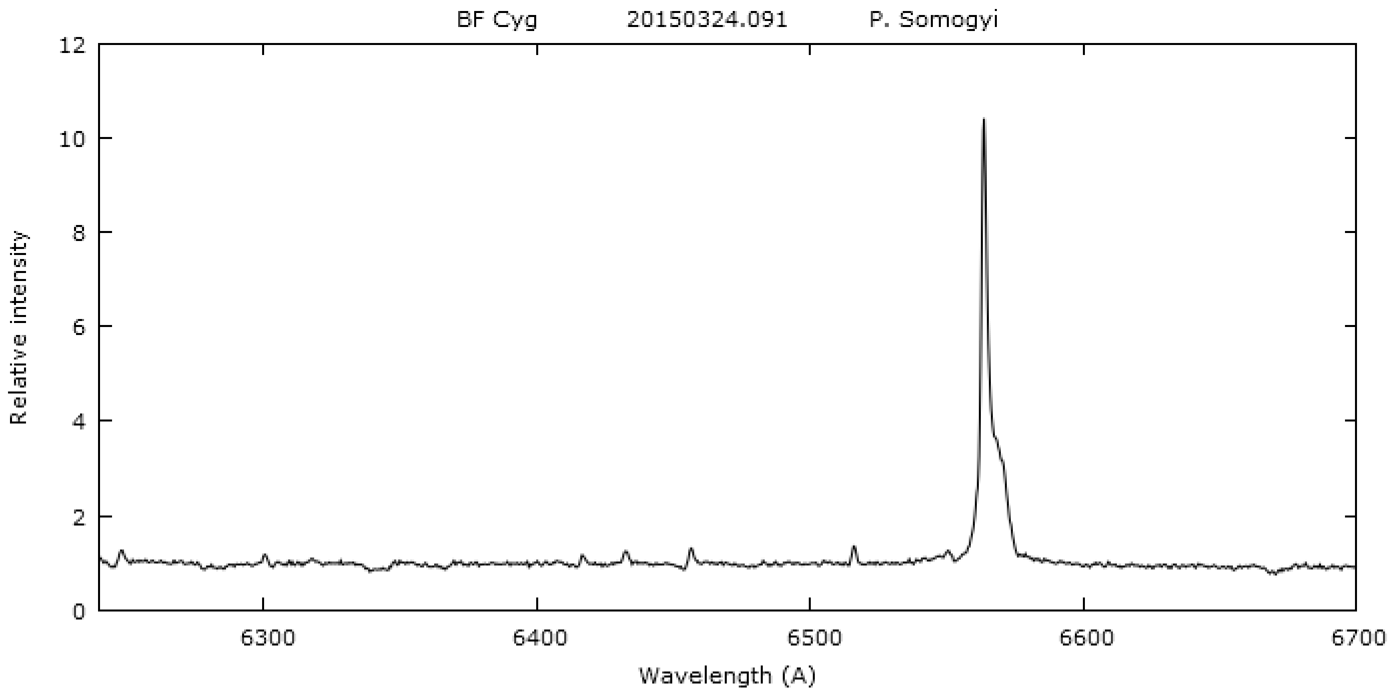
We report on the current high-level activity of the classical symbiotic star BF Cyg during its 2014-15 large flare (see ATel #7013). Our recent (U)BVRcIc CCD photometric measurements (2015 January 6.674 UT: U=9.83, B=10.27, V=9.72, Rc=9.12, Ic=8.34; February 16.184 UT: B=9.74, V=9.36, Rc=8.91, Ic=8.25) and UBV photoelectric photometry (2014 December 4.685 UT: U=10.36, B=11.05, V=10.46; 2015 February 7.166 UT: U=9.65, B=10.04, V=9.62; February 18.135 UT: U=9.42, B=9.78, V=9.43; March 17.130 UT: U=9.53, B=9.87, V=9.50 and March 18.073 UT: U=9.58, B=9.88, V=9.48) taken at the observatories of the Astronomical Institute of the Slovak Academy of Sciences confirmed the 2014-15 large brightening of BF Cyg as reported by Munari et al. (ATel #7013). Our multicolour photometry reflects a continuing activity of BF Cyg at a **high level around its historical maximum**. It is of interest to note that a 1.5-hour monitoring of BF Cyg in the B band, carried out on March 8, did not show any rapid variability to within of a few hundredths of magnitude.

On 2015 February 15.177 UT, 18.180 UT, March 10.140 UT, 11.126 UT, 19.121 UT and 20.121, we obtained Echelle medium-resolution spectra of BF Cyg (R ~ 11000) with our 0.6 m telescope (pavilion G1). The continuum profile (420 - 715 nm) dereddened with E(B-V)=0.35 mag was comparable with a stellar photosphere radiating at 7000 - 10000 K. The line spectrum was dominated by hydrogen lines. Their profiles were characterized with the central sharp absorption located at ~ -27 km/s, accompanied with the blueward deep and broad absorption terminating at ~ -550 km/s. Simultaneously, a strong emission bump with the terminal velocity of ~ +550 km/s developed at the red side of the emission line core. Similar type of the line profile was observed for the strongest FeII lines. Example of the H-alpha and H-beta line profiles from 2015 March 11 is available at http://www.ta3.sk/~astrskop/atel_032015/bf_hab.png . Such evolution can be interpreted in terms of a biconically collimated mass-outflow at its early stage (see Skopal et al., 2013, A&A, 551, L10).

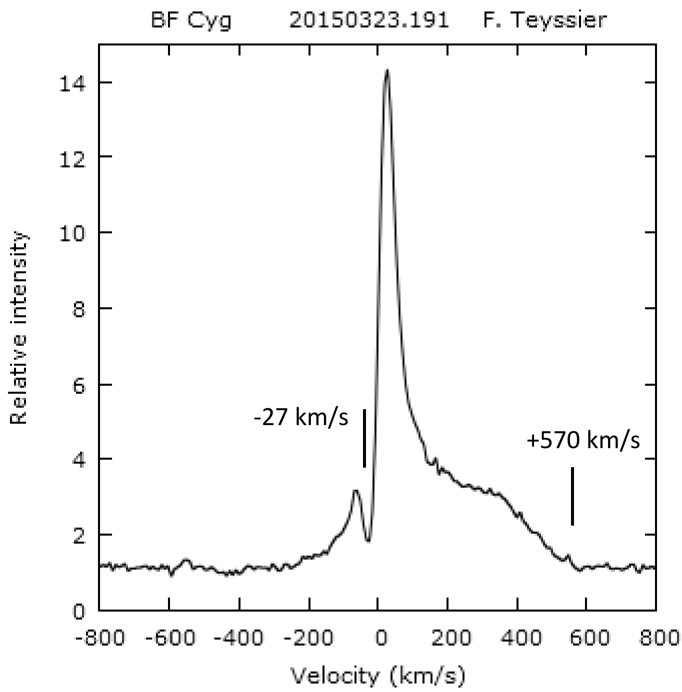
BF Cygni

The AAVSO V band light showing the last outburst





Peter Somogyi Lhires III 600 l/mm R = 3000



François Teyssier eShel = 11000
Spectrum corrected for heliocentric velocity
The central sharp absorption is located at -27 km/s and the strong emission hump in the red edge has a terminal velocity of 570 km/s

A explanation of the strong emission hump in Balmer profiles

Discovery of collimated ejection from the symbiotic binary BF Cygni

A. Skopal, N. A. Tomov and M. T. Tomova

Our spectroscopic monitoring of BF Cyg revealed for the first time the emergence of satellite-emission components to the Hα and Hβ emission lines from 2009.

… discovery of collimated ejection from the symbiotic star BF Cyg. The jets were indicated in thespectrum as satellite emission components to Hα and Hβ lines,which developed from 2009 – three years after the optical eruption.
During 2012, they became bipolar (see Fig. 1).

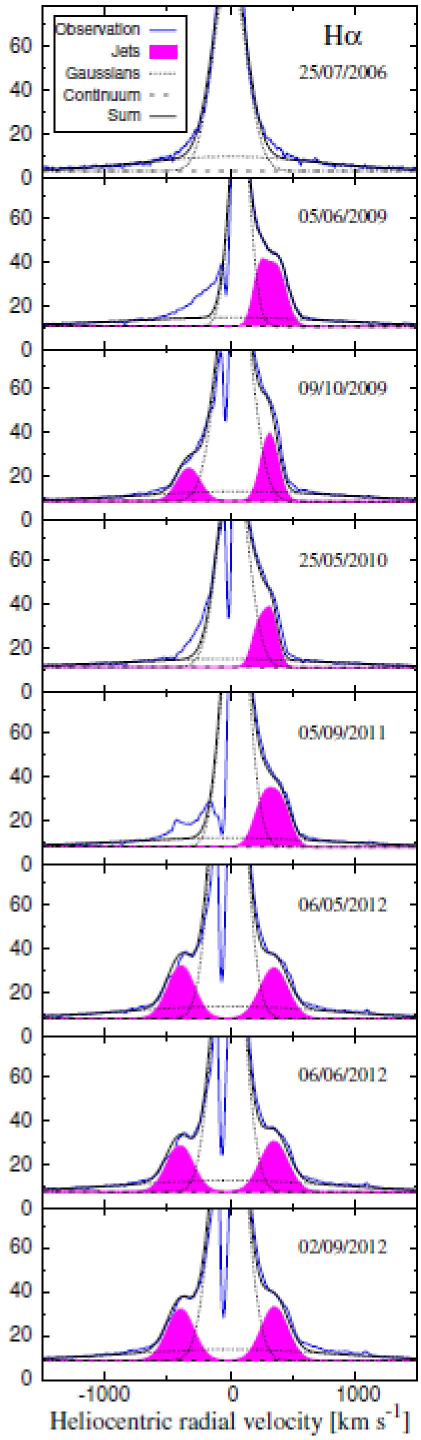
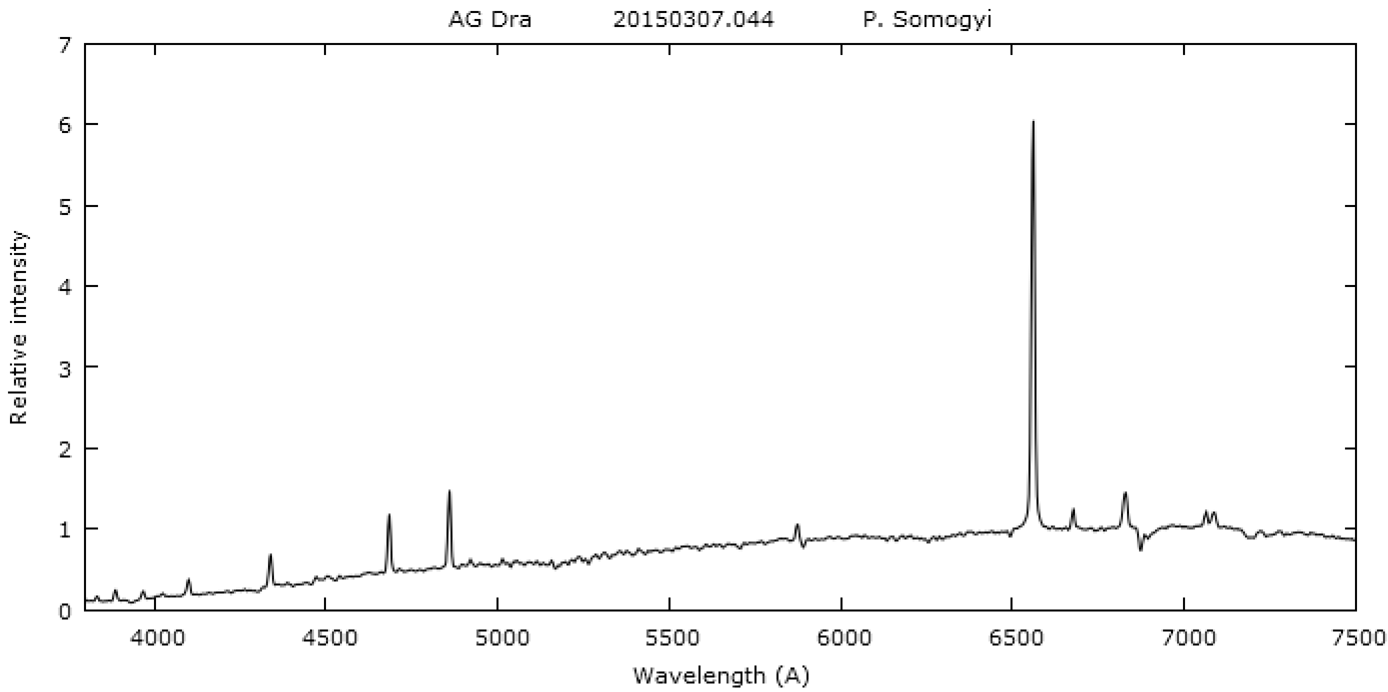
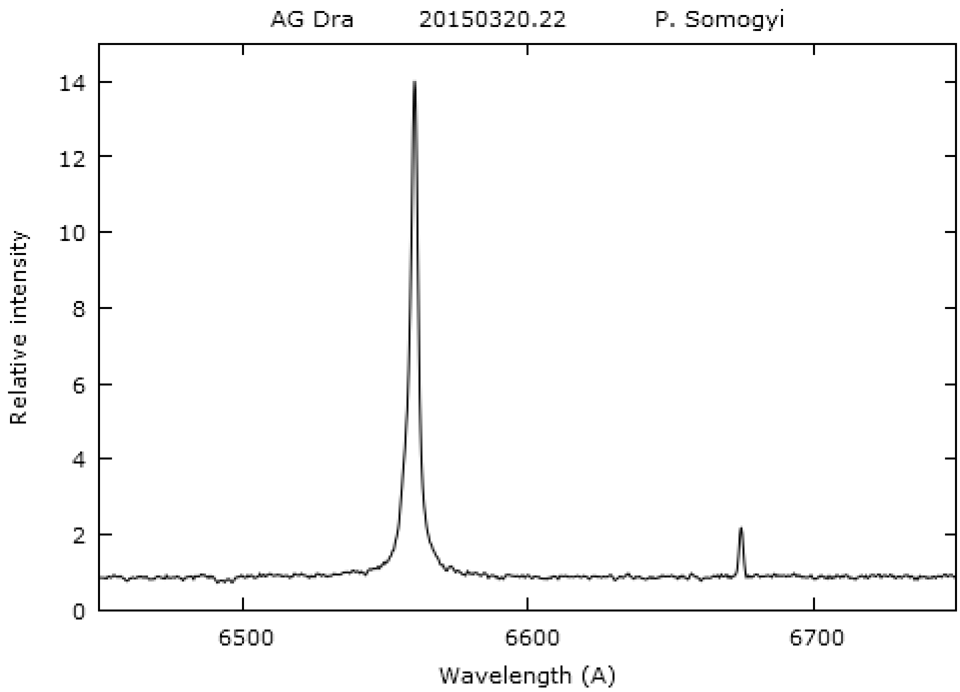


Fig. 1 from Skopal & al. (2013)

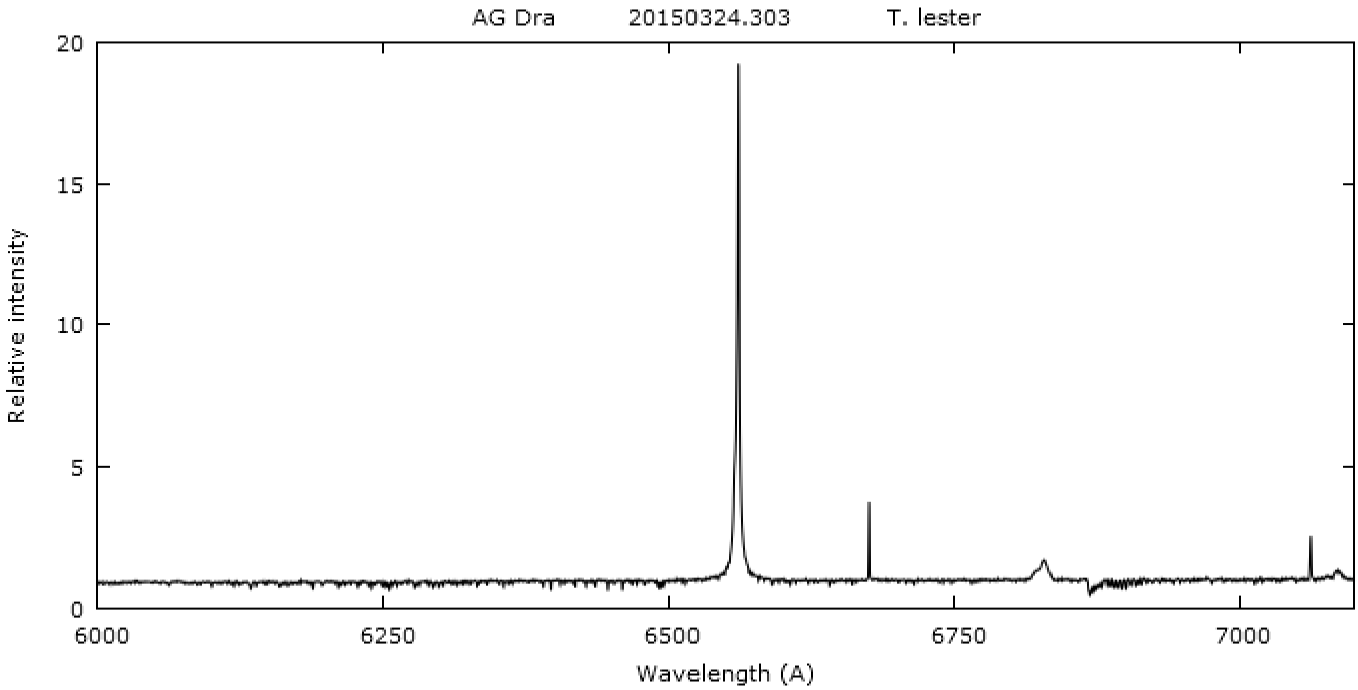
Coordinates (2000.0)	
R.A.	16 01 41.0
Dec.	+66 48 10.1

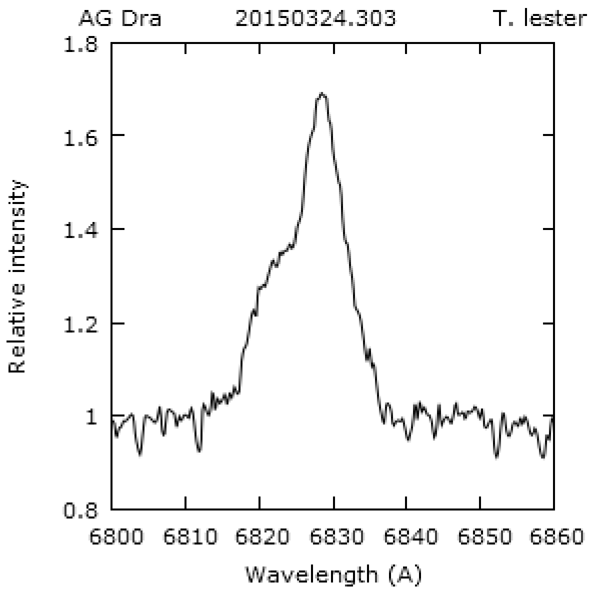




H alpha and He I 6678
P. Somogyi Lhires III 600 l/mm

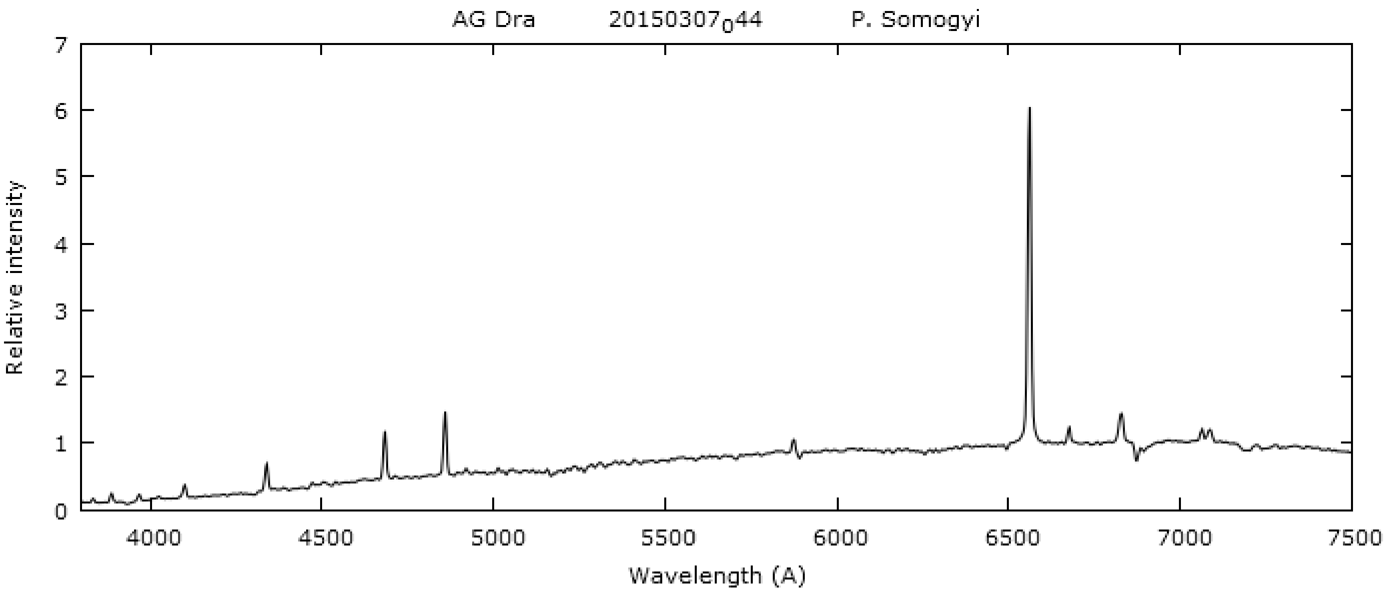
Coordinates (2000.0)	
R.A.	16 01 41.0
Dec.	+66 48 10.1

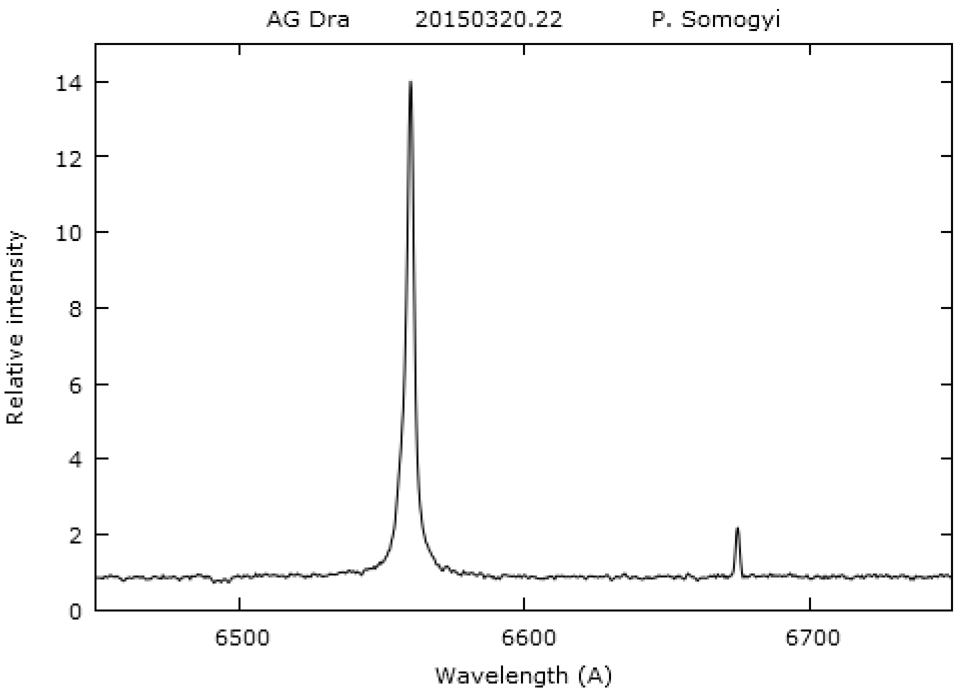




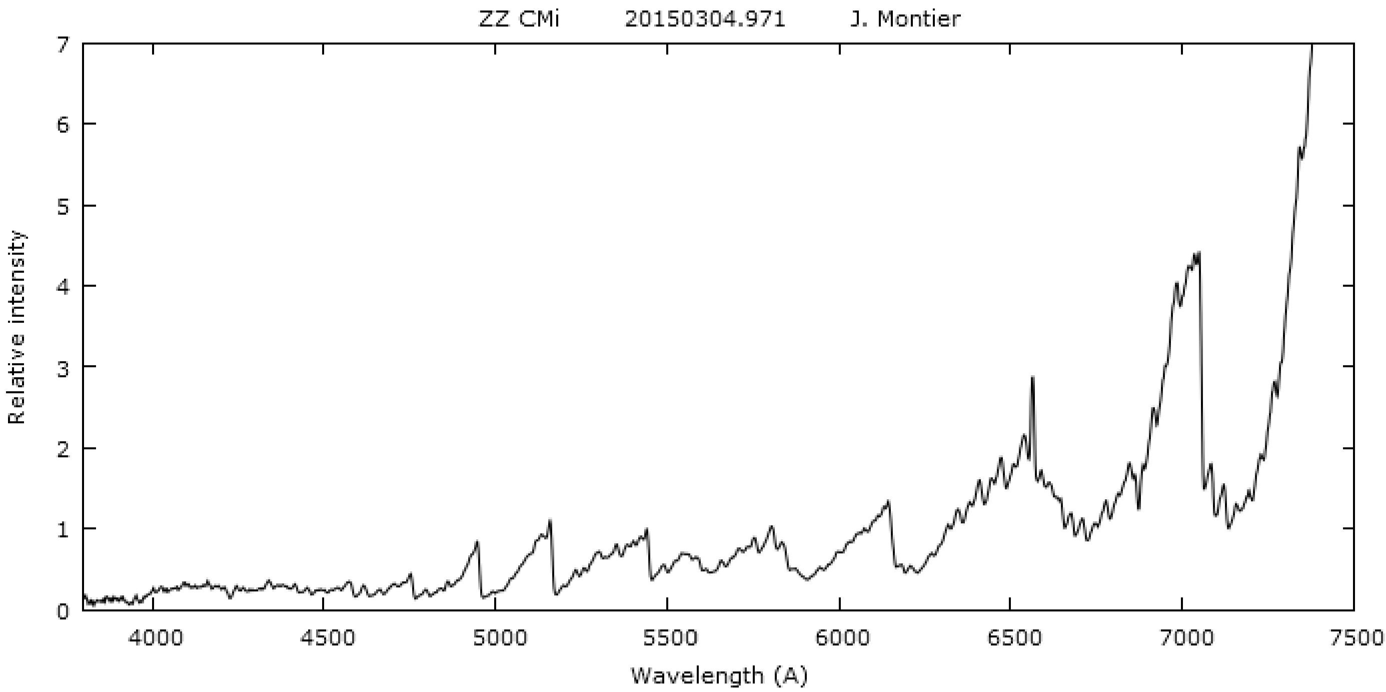
About Raman bands in symbiotic stars :
http://www.astronomie-amateur.fr/feuilles/Spectroscopie/Methodes_Spectro/Raman_OVI_6830_7088.html

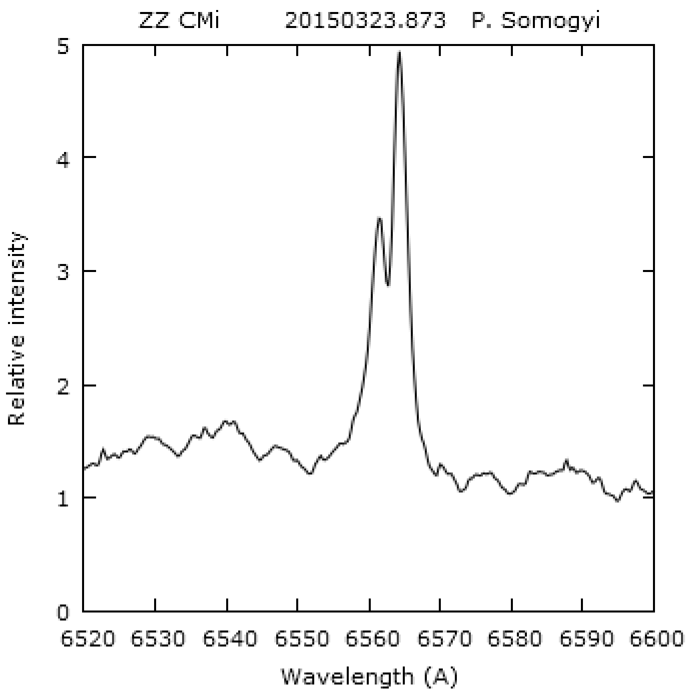
Coordinates (2000.0)	
R.A.	16 01 41.0
Dec.	+66 48 10.1

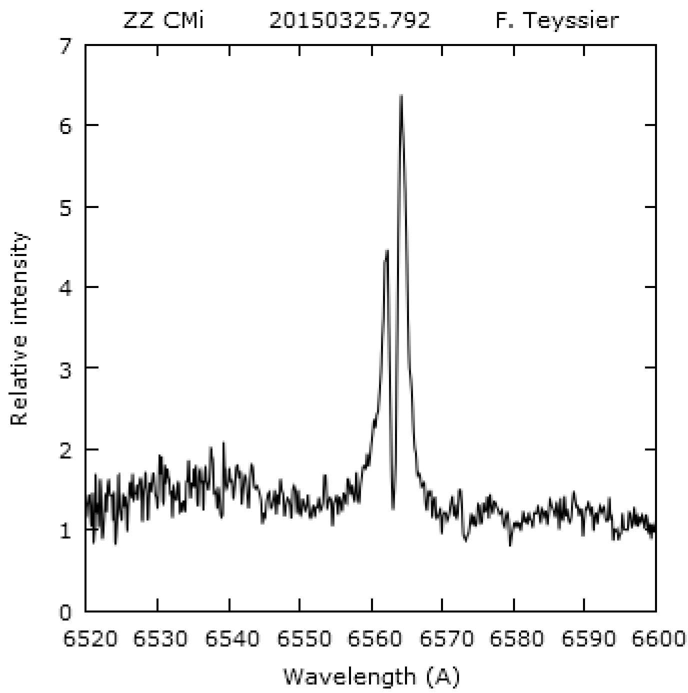




Coordinates (2000.0)	
R.A.	07 24 13.9
Dec.	+08 53 51.8



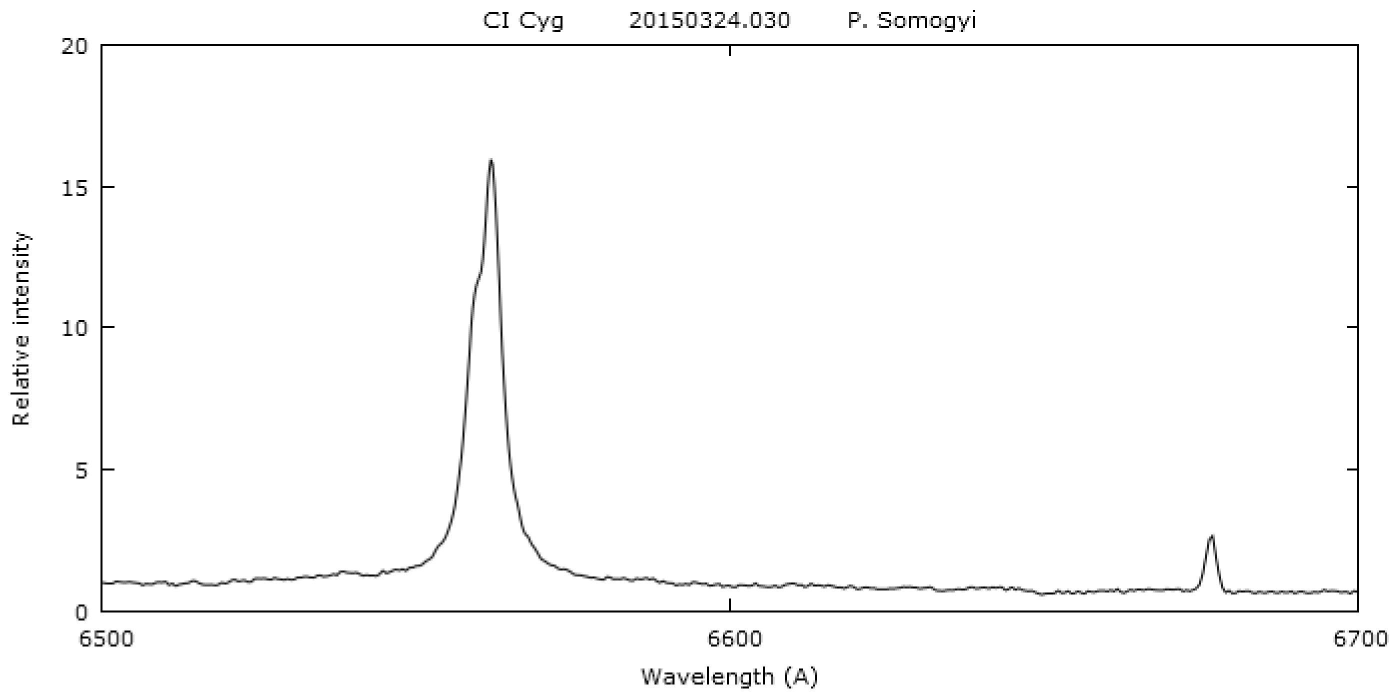


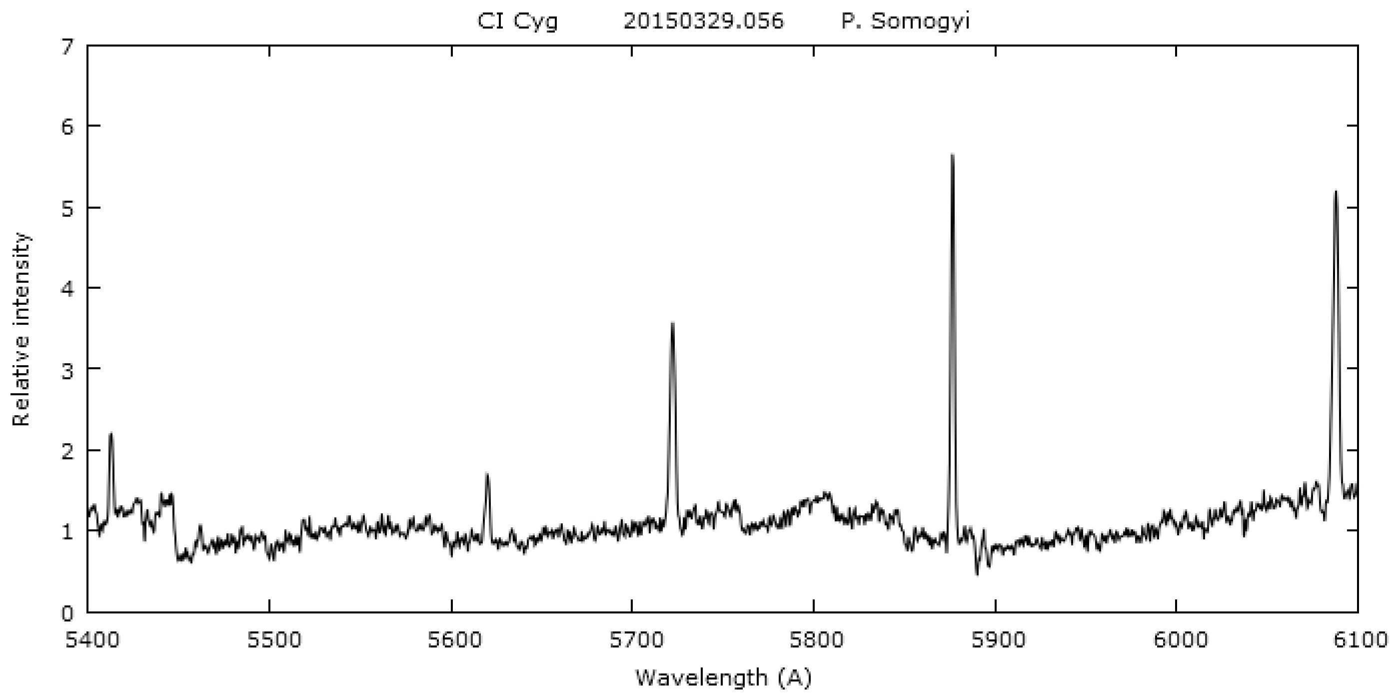


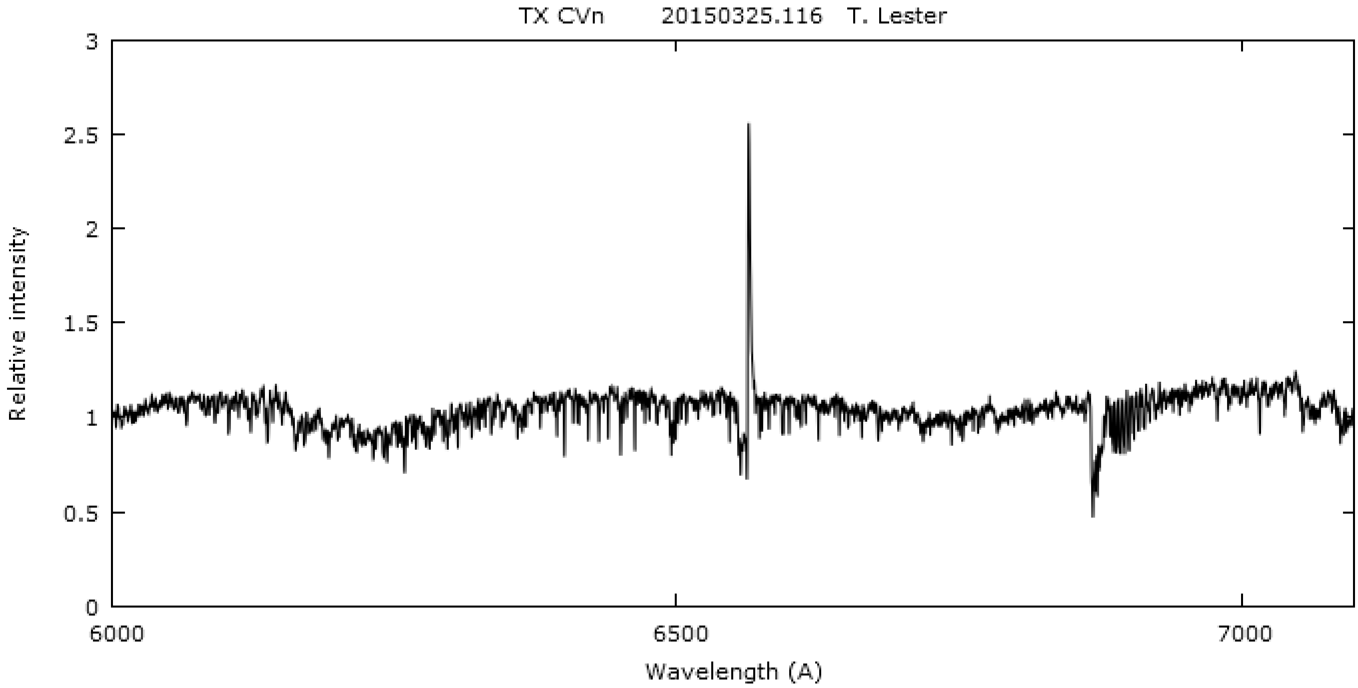
P. Somogyi
Lhires III - 600 l/mm - R = 3000

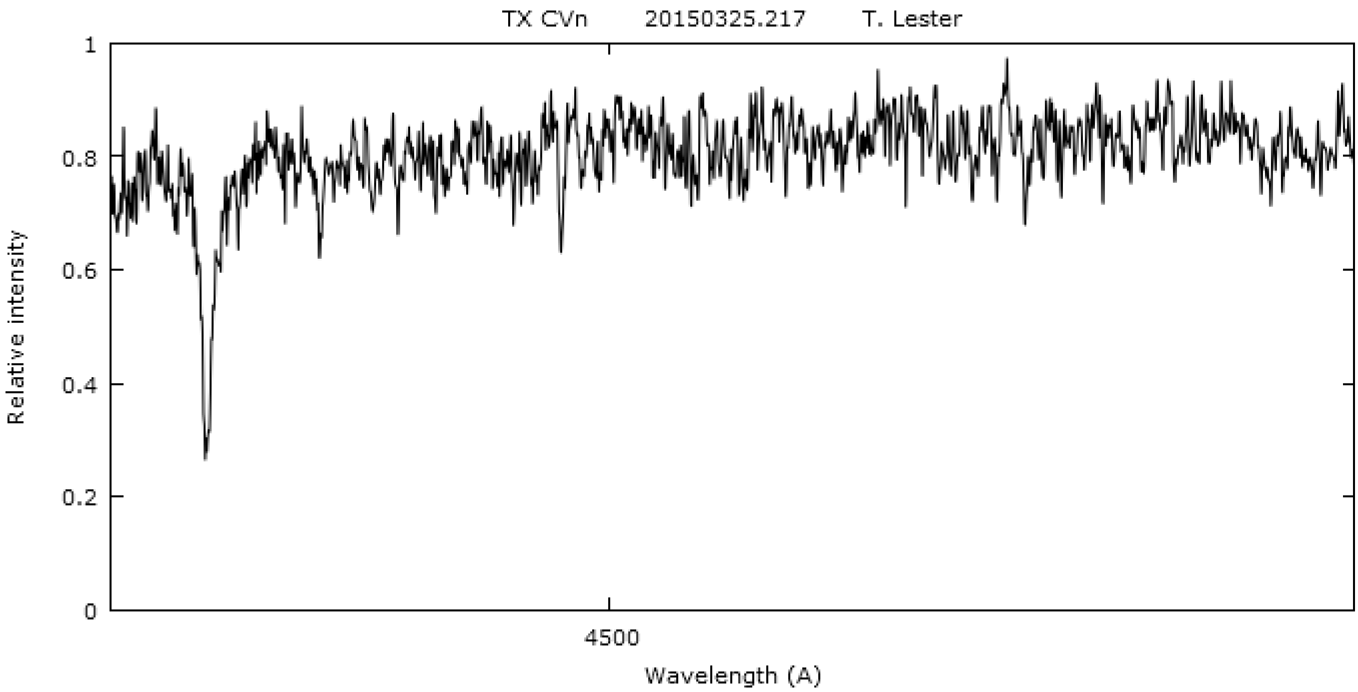
F. Teyssier
EShel - R = 11000

Coordinates (2000.0)	
R.A.	19 50 11.8
Dec.	+35 41 03.0



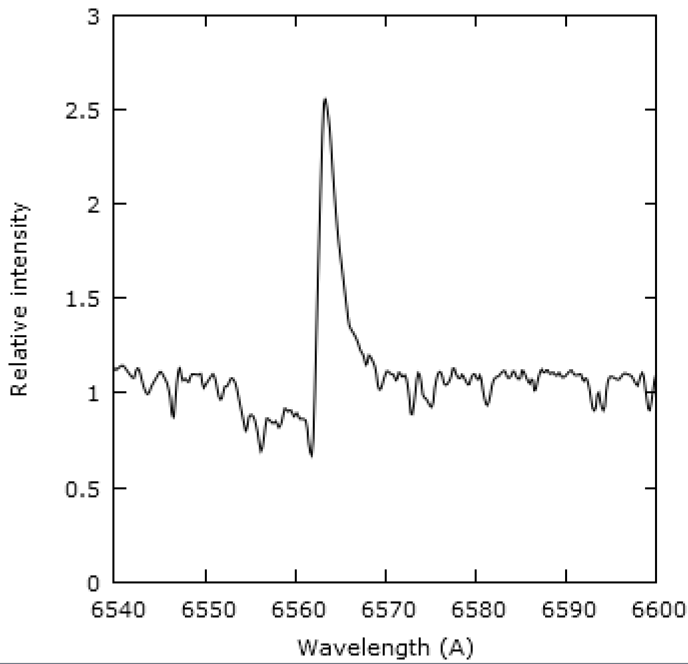


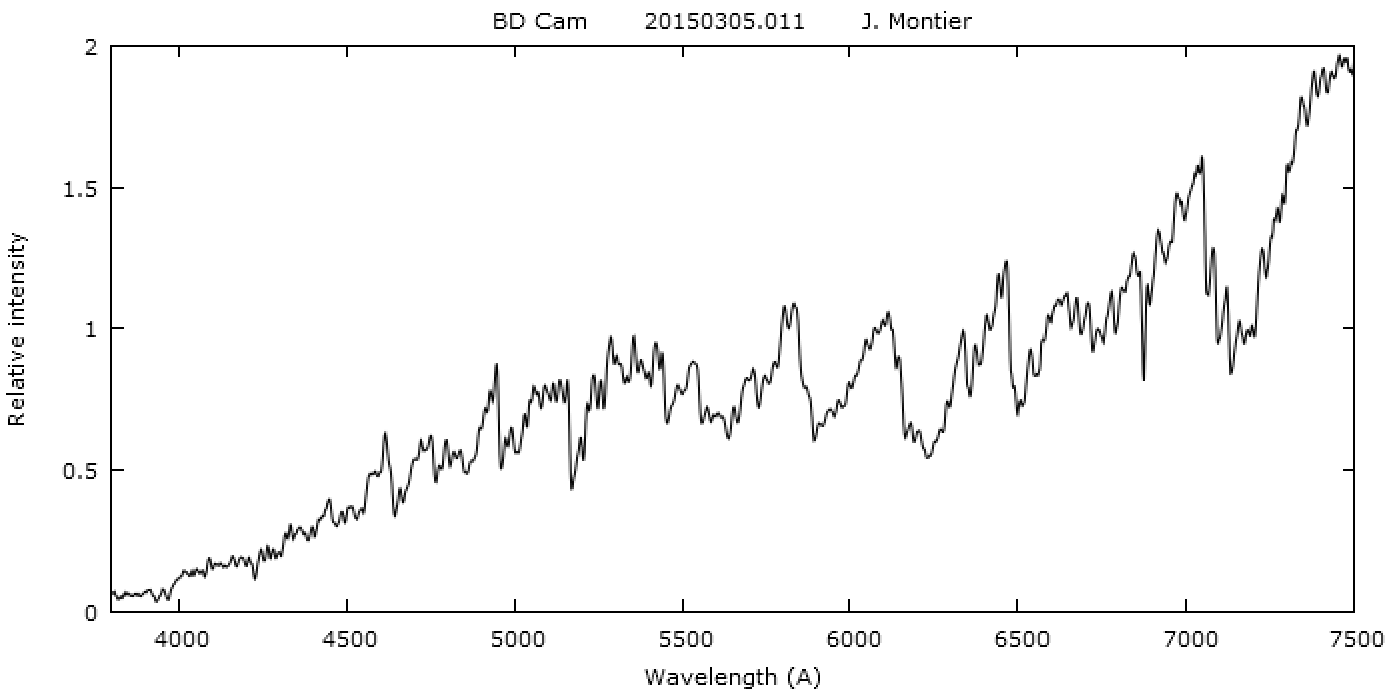


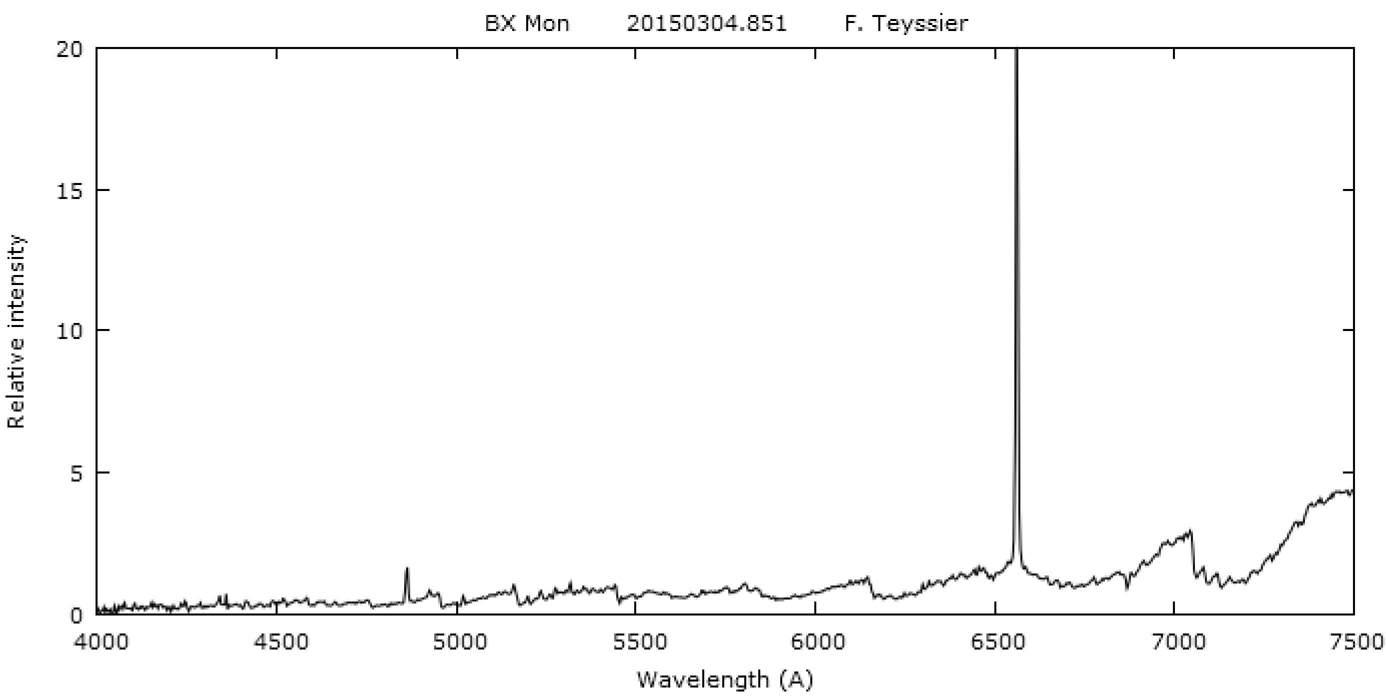


TX Cvn by T. Lester at R = 9000

Crop on H alpha with its absorption feature



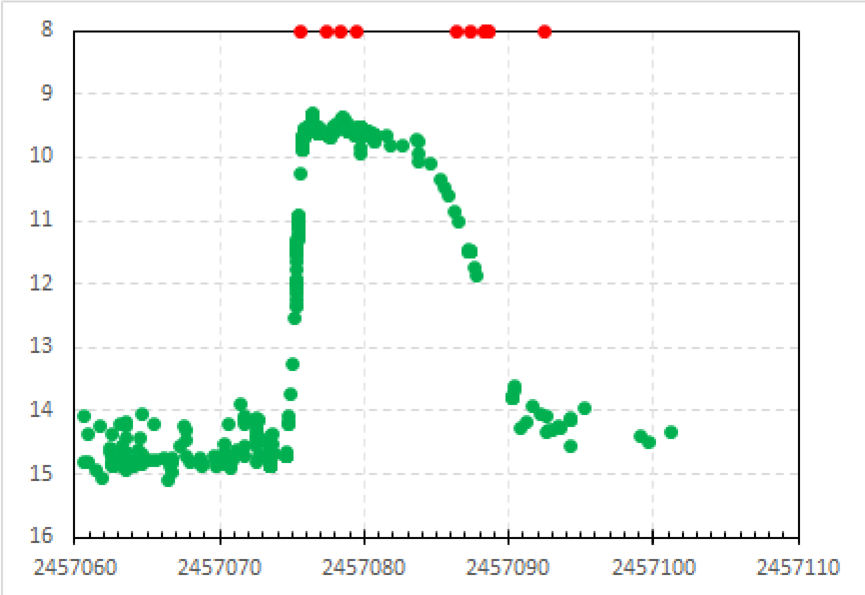

BD Cam 20150305.011 J. Montier
Relative intensity
Wavelength (A)
0
0.5
1
1.5
2
4000
4500
5000
5500
6000
6500
7000
7500


BX Mon 20150304.851 F. Teyssier
Relative intensity
Wavelength (A)
0
5
10
15
20
4000
4500
5000
5500
6000
6500
7000
7500

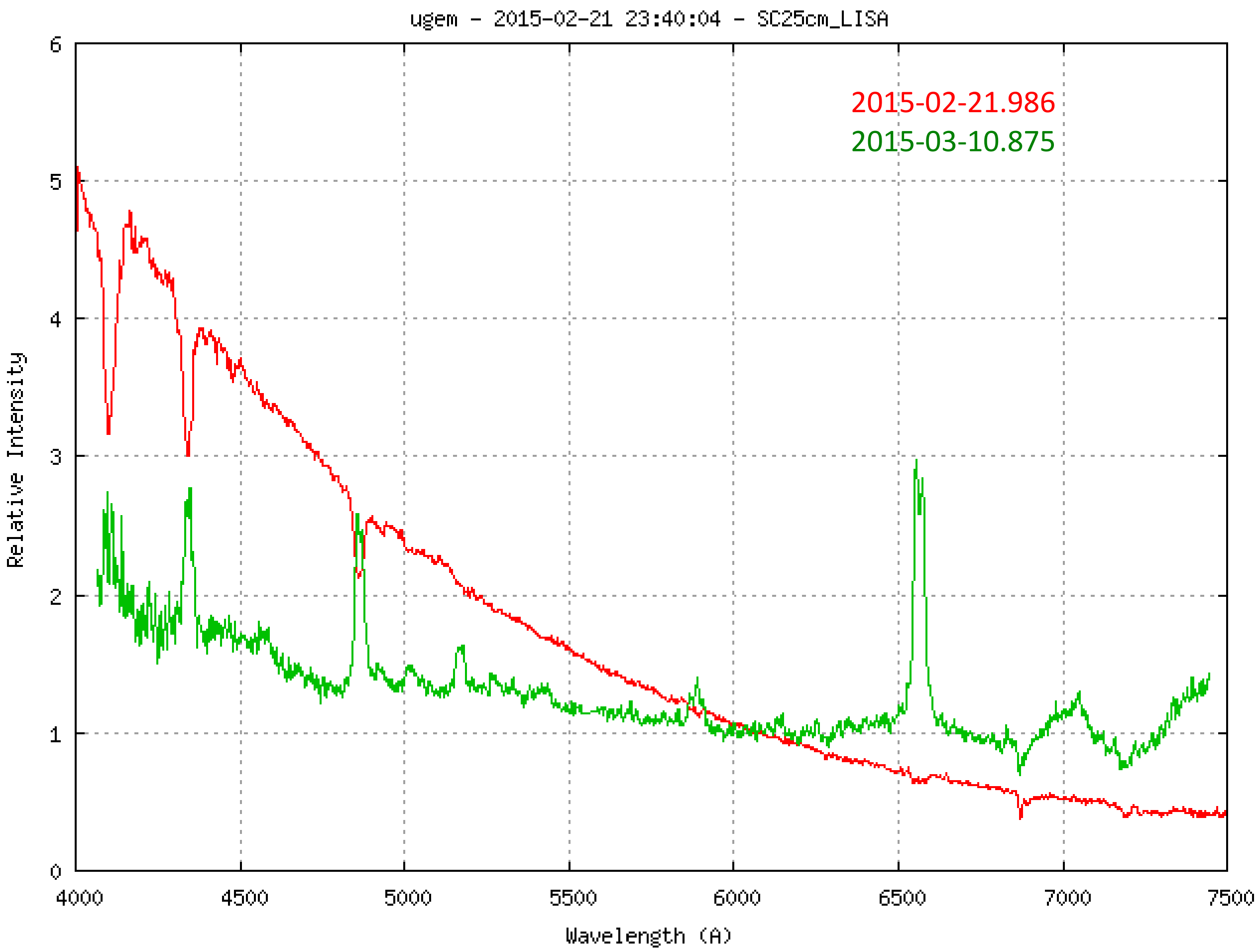
U Gem

Coordinates (2000.0)	
R.A.	07 55 05.2
Dec.	+22 00 05
V Max	9.1
V Min	15.2
Period	0.1769 d
Tn	102 d

The prototype of dwarf novae in outburst
February/March 2015



AAVSO light curve (V band)
ARAS Spectra : red points

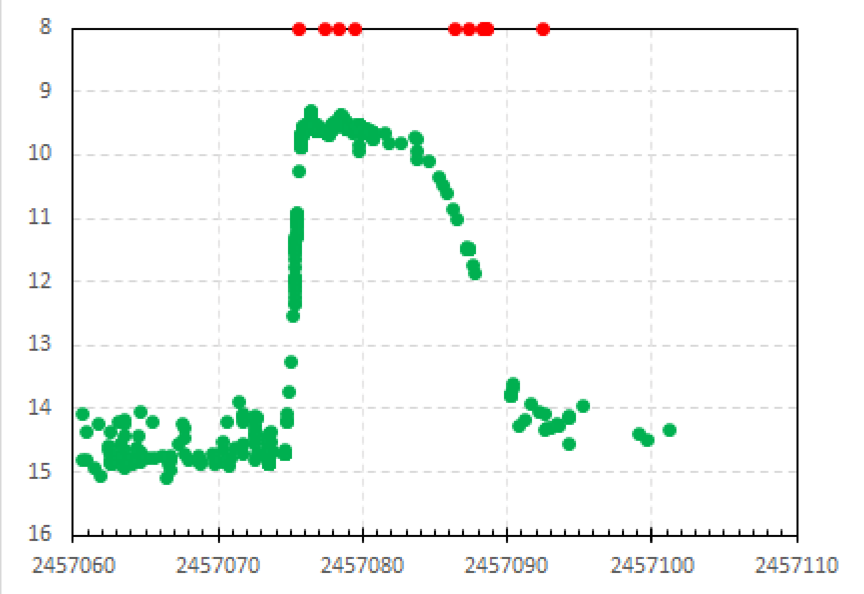


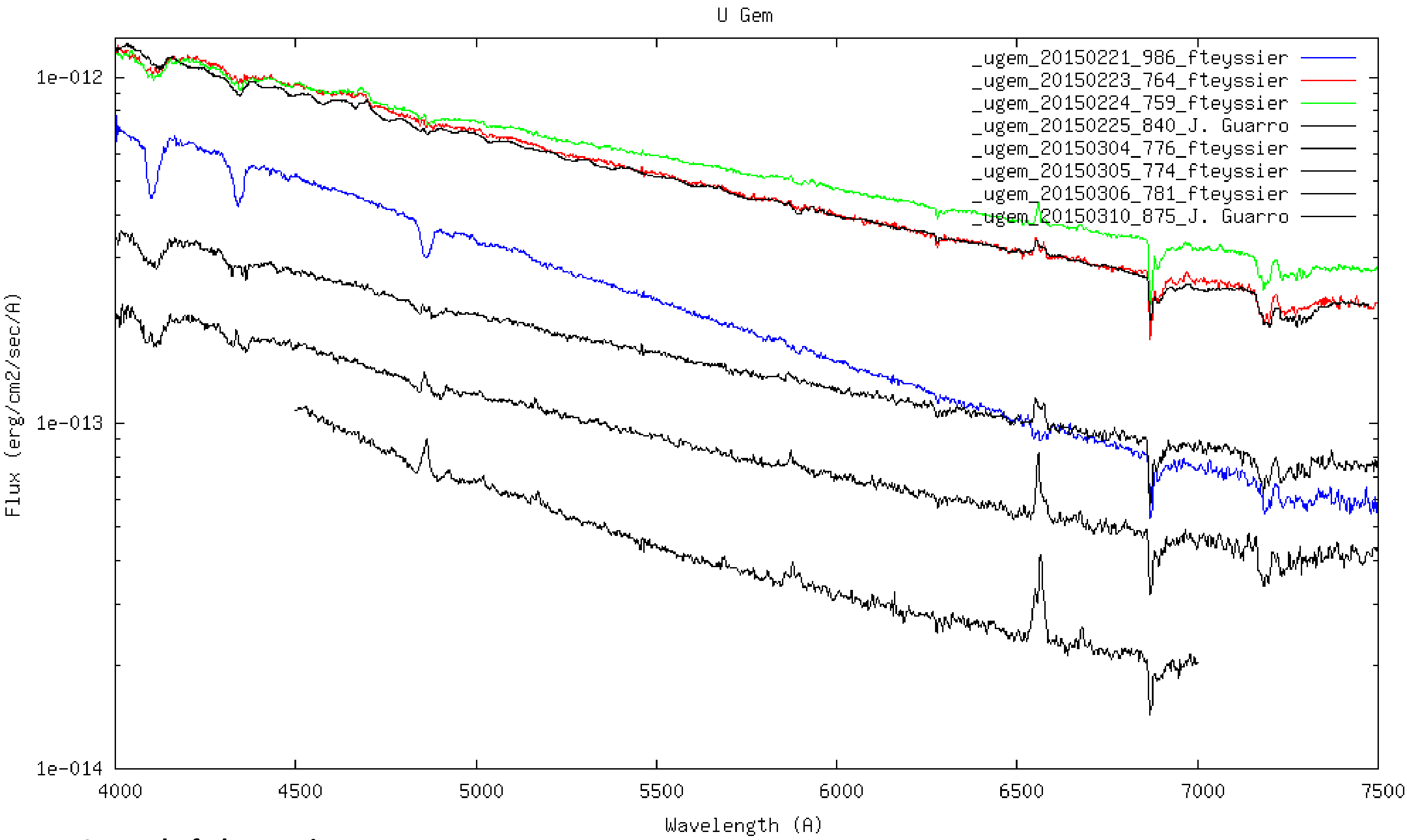
U Gem near maximum luminosity (F. Teyssier - LISA - R = 1000)
and coming back to quiescence (J. Guarro - R = 900)

Spectra :
http://www.astrosurf.com/aras/Aras_DataBase/DwarfNovae.htm

The evolution of the spectrum during the outburst.
The spectra have been flux calibrated using AAVSO data

Thanks to Tim Lester for this presentation





Journal of observations

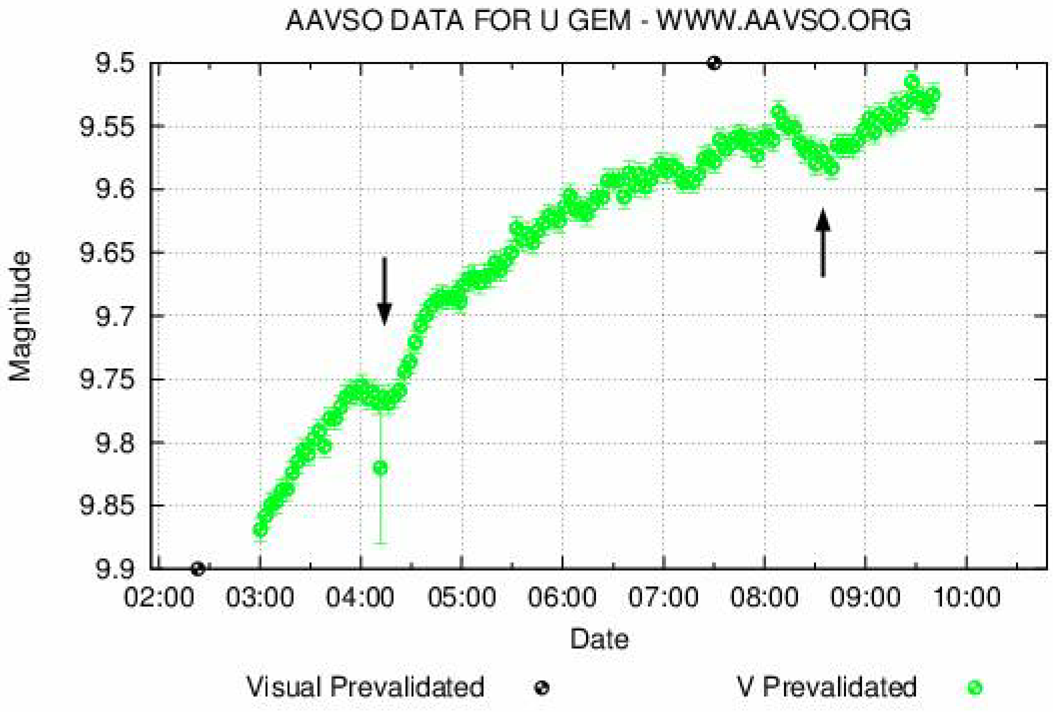
1	21/02/2015	23:40:04	2457075.502	F. Teyssier
2	23/02/2015	18:19:33	2457077.278	F. Teyssier
3	24/02/2015	18:12:23	2457078.275	F. Teyssier
4	25/02/2015	20:09:19	2457079.402	J. Guarro
5	04/03/2015	18:36:58	2457086.29	F. Teyssier
6	05/03/2015	18:34:59	2457087.303	F. Teyssier
7	06/03/2015	18:44:31	2457088.309	F. Teyssier
8	06/03/2015	19:02:07	2457088.307	P. Somogyi
9	06/03/2015	20:02:19	2457088.335	P. Somogyi
10	06/03/2015	20:22:23	2457088.363	P. Somogyi
11	06/03/2015	21:20:20	2457088.403	P. Somogyi
12	06/03/2015	22:00:28	2457088.431	P. Somogyi
13	06/03/2015	22:40:36	2457088.463	P. Somogyi
14	06/03/2015	23:32:43	2457088.502	P. Somogyi
15	10/03/2015	21:00:34	2457092.445	J. Guarro

See also the nice animations produced by Peter Somogyi on ARAS Forum

http://www.spectro-aras.com/forum/viewtopic.php?f=5&t=1076&start=10

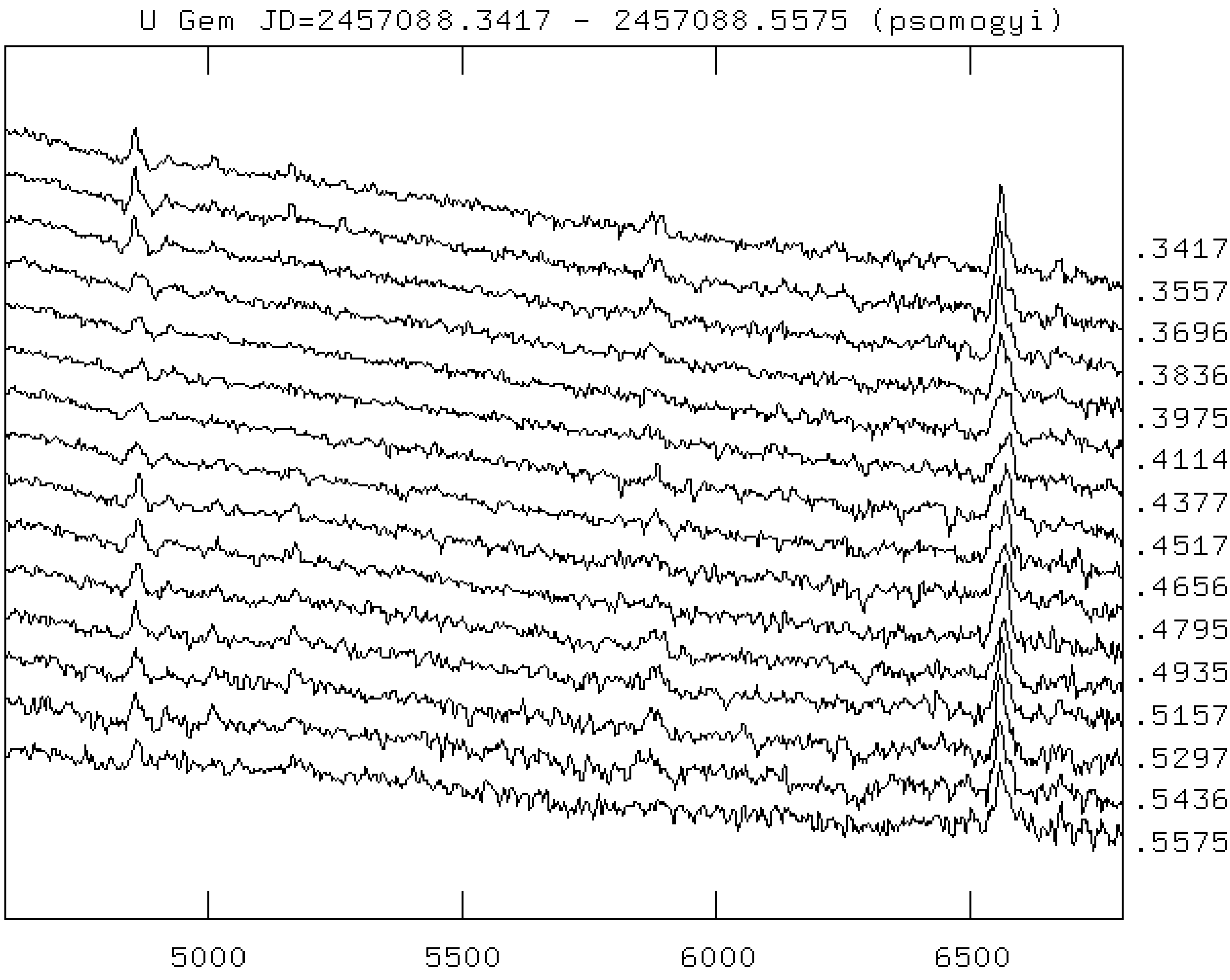
http://www.spectro-aras.com/forum/download/file.php?id=2183

http://www.spectro-aras.com/forum/download/file.php?id=2187



During the decline, Peter Somogyi produced a time-series observation (every 20 mn), showing the evolution of the profiles of the lines, especillay Ha and Hb
Graph by Peter Somogyi.

Thanks to Paolo Berardi for the AAVSO light curve showing the two minima (partial eclipse of the disk)
The orbital period is 0.1769 d. (4.246 hours)



Steve Shore

Nova Sgr 2015B

The developments in Nova Sgr 2015B over the last weeks has been interesting but, except for the infrared CO and C I emission, not really that unusual. The appearance of the He I lines was interesting at the start, the end of the fireball phase is marked by the first recombinations that star the growth of the neutral atomic lines and de-excite the inner parts of the ejecta. hence,as your spectra show, the He I and related strong lines, those arising from excited states (e.g. O I 8446) show detached P Cyg troughs at near the maximum velocity seen from other transitions. The Na I absorption is stronger in this nova than V705 Cas (the one for which there's also UV data, most dust forming novae weren't obtained shortward of 3000A).

Light curve oscillations and related effects

Francois added, in the last discussions, that there would be interest in the question of the oscillations in the light curves of classical novae at maximum light. So a word on this, some of it speculation, with your indulgence.

In the early days of nova studies, by which I mean the pre-``Galactic Novae'' era the monograph by Payne-Gaposchkin) -- there were only two quantitative measurements possible for novae in outburst. Given the limitations of photographic plates, the line widths and velocities of absorption (and emission) features could be obtained for the brightest (when resolutions were sufficient) or given only as crude estimates from lower resolution spectra. The conversion of photographic material to spectrophotometric profiles required an intermediate transformation of the transmission of light through the plate (sensed with a photometer) to a tracing. Little, if any, of this data were calibrated in intensity, usually the profiles were noisy and unique. The equivalent width could be estimated by microscope and micrometer but that to depended on the observer. Instead, with the development of photoelectric photometry, the light curves took on a quantitative role in the analysis. Not that the absolute calibration of the Vega magnitudes had been determined, but at least there was a linear comparison sequence using standard filters, for instance those introduced by Johnson and Morgan (UBV). Thus, the simply measured properties of novae, most significantly their rate of decline in the optical, became a standard taxonomic criterion after the study by Payne-Gaposchkin and the links to spectroscopic phenomenology from McLaughlin.

The problem was that for many classical studies, those before the era of CCDs and comparative photometry within single fields, the observations were often fragmentary. Although the light curves were obtained in a more precise way, the sampling was far more difficult. Using these, the rate of decline became the standard unit, using two and three magnitudes (visual) as the standard to separate the classes.

The problem that's emerged, especially in the last decade, is the poor definition of the t_2 and t_3 parameters. Novae don't show regular behavior at peak and their photometric evolution is not identical in different bands. Photographic emulsions were more blue than red sensitive but the light curves included lines that have substantial widths. This remains true for filter photometry. Looking at the spectra you've been accumulating over these years, notice that during the strong line phase of emissions the lines can have ratios of 5-10 relative to the continuum over an interval of perhaps 30 A (so the equivalent width of, say, Hα would be with these parameters about 300 A). Now in R, this amounts to 50% of the continuum contribution. OK, I've chosen an extreme case but remember that when the photometry is near peak the spectral evolution is especially complicated because of the high optical depth of the ejecta and the beginning of the P Cyg transitions in the strongest lines. Any structure in the ejecta that alters both the line profiles and the opacity within a single line changes - substantially - the photometry.

Add to this that the white dwarf has just undergone a rather unpleasant episode in its life, a thermonuclear runaway and explosion with the loss if its envelope. We know from the rapid appearance of the thermal X-rays as the ejecta clear that the source doesn't suddenly turn on when it's first seen. Instead, even during the highly opaque stage (at least as we see the source) it is smothered by the surrounding matter. The photons both ionize the ejecta, producing the re-ionization event that follows the recombination wave from the start of the expansion, and heat the matter. We don't know what the state is of the WD at this time. It's very likely that the mixing produced by convection during the first stages of the TNR that transported fuel into the hydrogen-rich layers penetrates deep enough that even after the explosion some hydrogen and CNO nuclei remain and continue reactions. This is the supersoft source phase of which I've so often spoken. This isn't exactly on the surface of the star, buried within the envelope it produces photospheric temperatures of a few 100 kK to about 1 MK. In other words, the source, with luminosities that are related to the WD mass by the Eddington luminosity (which is about $3x10^4$ $(M/M_{\odot})$ L$$_{\odot}$). This isn't a strict limit, it's where the gradient of the radiation pressure is so high that the resulting acceleration drives a strong mass outflow that would rapidly deplete the burning region were it to continue. In general, multiwavelength observations in this stage don't indicate a strongly super-Eddington phase of any significant duration, the luminosity by the time of the end of the fireball has usually fallen by about a factor of a few. That's rather qualitative, but the UV is often not well covered in the optical peak stages and the the flux redistribution that produces the optical maximum is ver sensitive to to the geometry and structure of the ejecta. remember, these are merely a filter that re-radiates the higher energy incident radiation at the appropriate, lower energies because of diffusive transport. So the ejecta convert (bout not quite conservatively, depending on filling factors and the like, the illumination into the visible (as we've discussed some time back for the maximum of V339 Del).

Whether the nuclear source is unstable and occasionally flashes or settles into a lower luminosity stationary state is unknown. Of the interval from the explosion to the later stages of the WD burning, the critical interval that is masked by the Fe-curtain stage, we know very little theoretically or observationally. Too much is happening in the radiative transfer to uniquely solve the inverse problem of determining the source properties from the observed spectra. And the theoretical models are not yet able to perform three dimensional nuclear modeling of shell burning. Bu there are several possibilities. One is flashing, like that on the asymptotic giant branch of red giant evolution, when the nuclear shell sources in the red giant interior go through violent flashes that produce strong convective mixing and turbulent transport of matter while changing the stellar radius and surface temperature. These are much longer duration because they happen so deep, the radiation has to emerge from a large mass fraction and this diffuse process takes decades. Instead, the same thing on a WD would take days, the overlying envelope has a very low mass fraction, and the thermal timescale (for diffusive transport) is short. At peak luminosity, it's possible that a shortlived wind could be driven, or at least shells could be expelled, if the luminosity is anywhere near the critical value. This is not the Eddington value because opacity in these outer laters is larger than for the electron scattering used to estimate the limiting luminosity.

My apologies for the technicality here. Electron scattering, since it involves neither absorption nor resonance, is the lowest value of the opacity and thus gives the estimate of the highest radiative forcing an envelope can sustain. Adding in absorption lines (not ionization continua or bremsstrahlung, both of which produce mainly heating because they're collisional and destroy the incident photon) allows for scattering, indeed multiple scattering, and increases the momentum transfer (kick) efficiency of the radiation. So were there to be multiple ejections, these would slam into the slower moving parts of the ejecta and produce shocks in the base of the ejected matter. Nonetheless, these would dissipate energy rapidly, the mass ejected would not have a very high velocity (near escape but still, potentially, accelerating) so would heat the ejecta that would then diffusively transfer the energy outward. The same would, however, happen if there were no mass ejected but, instead, just radiation. The energy density would increase and the ejecta would brighten, then decrease, like a successive series of recombination and ionization waves. While I (personally) think this is a more likely cause of the emission variations, they're connected. The main thing is that in the optical spectra this would be still deeply imbedded nuder the pseudo-photosphere so changes seen in the optical lines would not necessarily mean a dynamical readjustment of the ejecta.

In a few cases, the pulses persist after the end of the Fe-curtain, that part responsible for the optical maximum and decline. One case, V5558 Sgr, showed He II variations during the pulsing that could be from changes in the effective temperature of the white dwarf long after the ejecta had become transparent, when the XRs and far UV penetrate throughout the ejecta. How long this persists depends on the longevity o the central nuclear burning and that, in turn, depends on how much of the accreted mass remains on the WD. So the process is not a simple one and the key is high cadence spectroscopy covering enough transitions that the relative phasing of the line variations can be determined. This relates to the ionization changes.

To see the timing of the different transitions and the velocity structures (and their persistence in the later spectra) will be the clue to the origin. Note that this is not secondary explosions, the ejecta were expelled by that event. Whatever is driving the optical photometric changes is connected with the radiative properties of the WD alone. The driver for the explosion, the beta-decaying ashes of the nuclear runaway, have such short halflives that they can't possibly be produced again in sufficient quantity to expel anything. But the burning can produce an outflow is the luminosity remains high enough for long enough.

This will likely seem an equivocal discussion and, I'm afraid, it must so remain. You see, this is a frontier area of the understanding both of novae and, in a related sense, symbiotics. One thing we know. In the symbiotic-like recurrents this doesn't happen. The light curves don't show this sort of multiple ejection behavior and the spectroscopy is very much dominated by the forward sock as the ejecta plow into the red giant wind. In most fast recurrents from compact systems, this doesn't happen but they don't sustain any substantial Fe-curtain phase (the ejecta masses ae too low). And even if the ejecta are not spherical (surprise) the photometric variations still occur even if there won't be any associated absorption changes since the ejecta see the WD differently than the observer (you). There could still be a signature in the emission lines, components that come and go if here were shocks propagating through the mater. But what we see is that the structures first obtained from the optically thick stage remain even in the emission lines and late-time absorption at high velocity even at years after the outburst.

Steve Shore, 06-04-2015

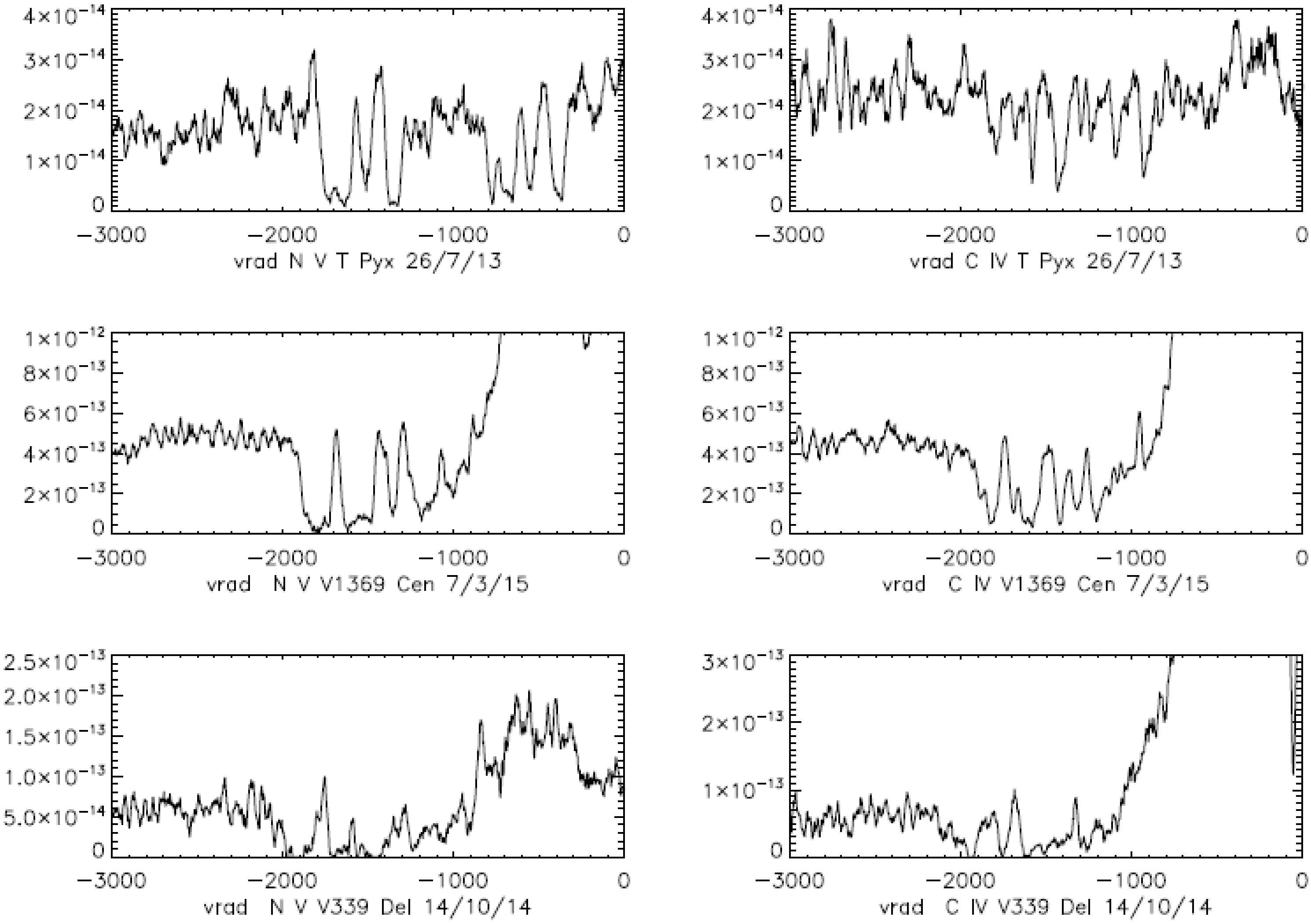


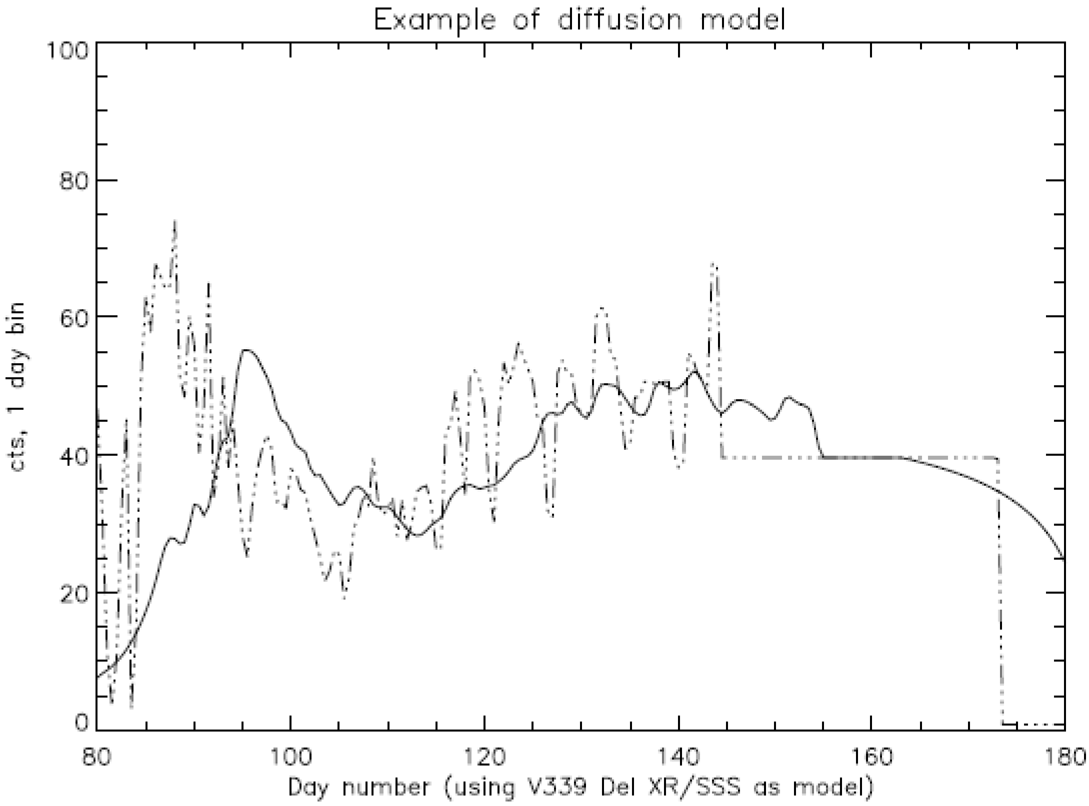
Fig.1 - the **persistent late-stage absorption lines from three novae** shows that this is a stationary velocity lower than the ejecta maximum velocity.

Fig.2 - Diffusion model

The first is a diffusive model taking the XR source from V339 Del and diffusively transferring it through the ejecta

This assumed an optical depth of about 100 on day 1 with a timescale of about 3 days for he diffusion. These are just estimates.

The light curve derived (solid line) was transferring the dashed line through the ejecta that are expanding with time. this is for illustration. Remember that this is the same scenario as the recombination wave calculation from the earlier discussions



Nova Oph 2015

The Astronomer's Telegram

ATEL #7339 ATEL #7339

Title: Optical Spectroscopy of Nova Ophiuchi 2015 (PNV J17291350-1846120)
Author: A. B. Danilet and T. W.-S. Holoien (Ohio State), R. M. Wagner (LBTO/OSU), C. E. Woodward (Minnesota), S. Starrfield (ASU), A. Wilber (ASU), F. Walter (SUNY), S. Shore (U. Pisa and INFN-Pisa)
Queries: mwagner@lbto.org
Posted: 2 Apr 2015; 17:21 UT
Subjects:Optical, Nova, Transient

Following the discovery by Y. Sakurai (Ibaraki-ken, Japan) on 2015 Mar. 29.766 UT of a new stellar object of magnitude 12.2 in Ophiuchus (S. Nakano, CBET 4086) and its subsequent confirmation as a likely He/N classical nova (K Ayani, CBET 4086), we obtained a spectrum (range: 398-685 nm; resolution 0.3 nm) of Nova Oph 2015 on 2015 April 1.459 UT with the 2.4 m Hiltner telescope (+OSMOS) of the MDM Observatory on Kitt Peak.

In agreement with the spectroscopic results described by Ayani, our spectrum shows strong emission lines superposed on a flat continuum of the Balmer series of hydrogen (through Hδ with our spectral range), He I (443.8, 447.1, 471.3, 492.2, 501.5, 587.5, and 667.8 nm), C II (426.7 nm), Fe II (423.3, 430.3 nm and others), N I (648.6 nm), N II (500.1, 547.9, 567.9, and 593.8 nm), N III (451.7 and 463.8 nm), and Si II (634.7 and 637.1 nm). The Balmer and He I lines exhibit prominent P Cygni profiles with terminal velocities of about 2500 km/s. Hα, He I 587.5, and 667.8 nm lines show a detached absorption component. However, He I 447.1 nm shows no absorption component. The FWHM of Hα and Hβ emission is about 1000 km/s, while the FWZI of Hα emission is about 4000 km/s. We measure a Hβ emission equivalent width of 0.34 nm and an absorption equivalent width of about 0.3 nm. The line profiles show evidence of multiple components; however, the emission lines are sharply peaked as opposed to rectangular in profile.

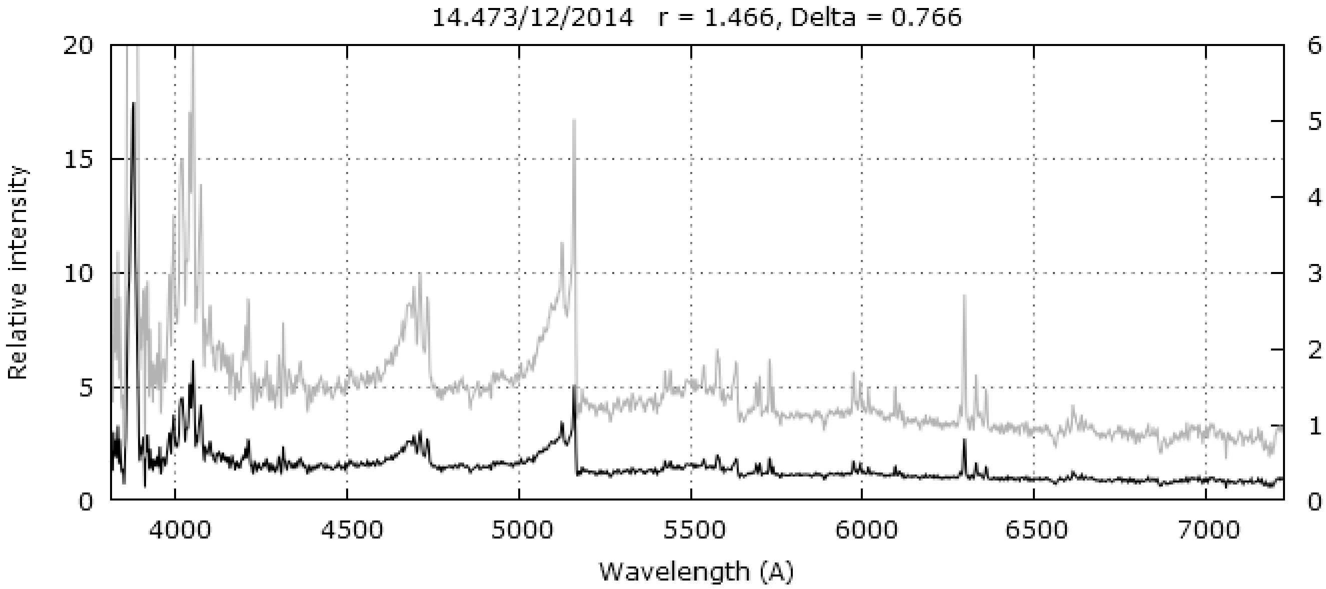
Examination of the POSS2/UKSTU red images from the DSS shows at least 2-3 possible progenitors of Nova Oph 2015 with red magnitudes of about 18-19 near the outburst positions reported by Nakano and others (CBET 4086). The nearest of these candidates to the outburst positions is located at α = 17:29:13.47; δ = -18:46:14.50 (J2000). If so, the outburst amplitude was at least ~7 magnitudes.

Our spectrum of Nova Oph 2015 is reminiscent of the He/N class of classical novae in agreement with Ayani (CBET 4086). However, the relatively lower velocities and sharply-peaked line profiles characterizing the outburst

Comet C/2014 Q2 (Lovejoy) ARAS observations **By Paolo Berardi**

The recent comet, discovered by the Australian amateur astronomer Terry Lovejoy and designated C/2014 Q2, has become an exciting spectroscopic target thanks to its brightness and comfortable position in the sky for northern hemisphere observers. It reached visual magnitude 3.9 in mid-January shining fairly high in the northern sky (it wasn't expected to become this bright).

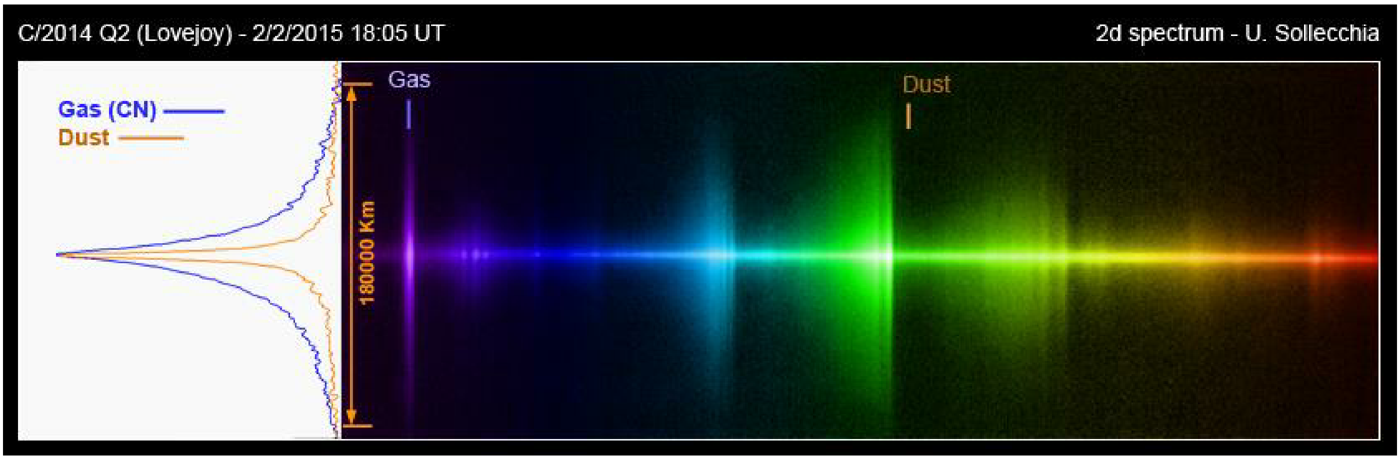
During the approach, comet C/2014 Q2 has crossed the sky from south to north so, as expected, the first spectrum of ARAS observers group arrived from an Australian amateur. On 14 December 2014, Terry Bohlsen observed the comet, shining at mag ~ 6.3, taking a spectrum with Lisa spectrograph.



Black line shows the spectrum scaled by the strongest feature while gray line profile has an expanded ordinate to better show the weaker features. Date, heliocentric (r) and geocentric (Delta) distances are shown at the top.

We can see several features that are very common in spectra of comets approaching the Sun. Most of them are due to electronic transitions in radicals having a resonance-fluorescence excitation mechanism. Radicals are produced from photodissociation of parent molecules hit by the Sun light. The complex bands have fine structures, discernible in high resolution spectra, originated from vibrational and rotational levels of molecules.

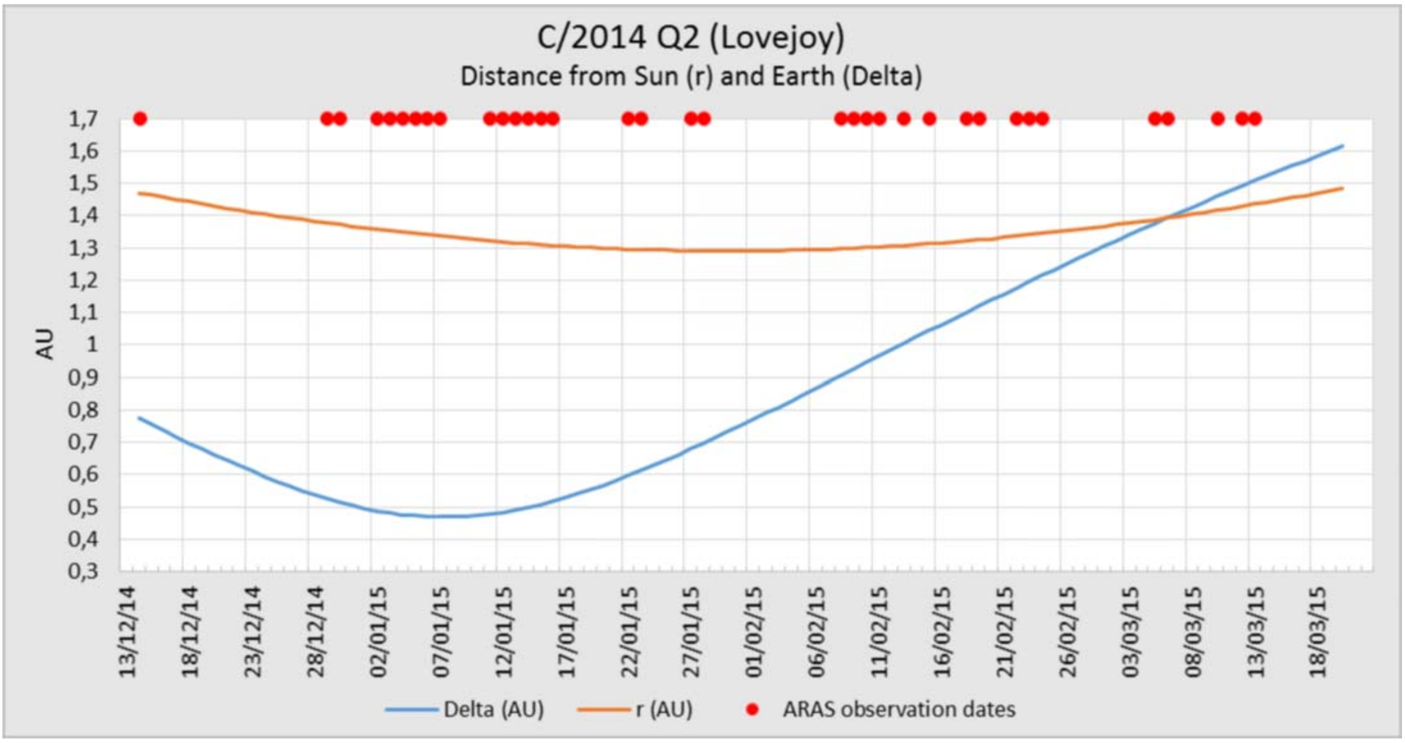
Being the light we receive from comets a combination of emissions due to gases released by the cometary nuclei material and sunlight reflected by dust grains, we also have a continuum in the spectrum (mostly concentrated in false nucleus zone). You may have an idea of the different spatial distribution of gases and dust in C/2014 Q2 comet looking at two-dimensional spectrum obtained with a long-slit spectrograph.



At very large heliocentric distances (r), comets spectra are essentially continuous (solar type). As comets approach the Sun, gas emissions becomes predominant, starting with first species CN (r < 3 AU), C3 and NH2 (r < 2 AU), C2 (r < 1.5 AU). Comets that get closer show several atomic lines in their spectra like Na (r < 0.8 AU) and other metals lines Fe, Cr, Ni,… (r < 0.1 AU) due to vaporization of grains.

The indicated distances are approximate. Sometimes NH2 and C2 (or CN and C3) emissions appears at the same time. Na emission lines intensity depends strongly on heliocentric radial velocity of comet because the Doppler shifted Na solar absorption lines modulate the fluorescence process. Not all comets have identical abundances of the parent species and gas-to-dust ratio may also vary with comet "age" (i.e. periodic comets can lose part of volatile elements due to frequent approaches to the Sun). The parameters C2/CN and C3/CN lines intensity ratio tell us if the comet is “carbon-chain depleted” or “typical” (it seem to be the C/2014 Q2 case).

Follows a graph showing the comet distance from Sun and Earth during the approach. Red marks on top relating to ARAS observations.



The C/2014 Q2 heliocentric distance was always below 1.5 AU with a minimum value of 1.29 AU on perihelion.

During the observing period, comet Lovejoy showed a relatively large amount of gas compared to dust. That is why the coma appears in photos with an intense green-blue tint. Indeed, in the optical spectrum of C/2014 Q2 we find strong emission bands of radicals CN (388 nm), C2 (three dominant bands from 450 to 565 nm), C3 (405 nm), NH2 (several bands from 520 to 740 nm). See also the color distribution in 2d spectrum showed above.

Spectra also reveal a strong contribution from atomic oxygen, one of the source elements of light in auroras. The forbidden lines of oxygen are located at 5577A (green line) and 6300/6364A (red doublet). Much of the cometary oxygen is contained in H2O ice that undergo photodissociation producing also excited atoms. Thus, the line at 6300A can be used to estimate the H2O production rate.

Also molecular ion lines can be found on cometary spectra due to photolytic processes and chemical reactions in the comae. Could be the presence of H2O+ lines around 620 nm in comet Lovejoy observed spectra. Generally, strongest CO+ emissions bands in UV/blue spectral region are responsible for the blue appearance of the ion tail in color images of comets.

It should be noted that high resolution ARAS spectra show a very large number of emission lines, including many I wasn't able to identify (apart radical band structures). It would be desirable an in-depth analysis.

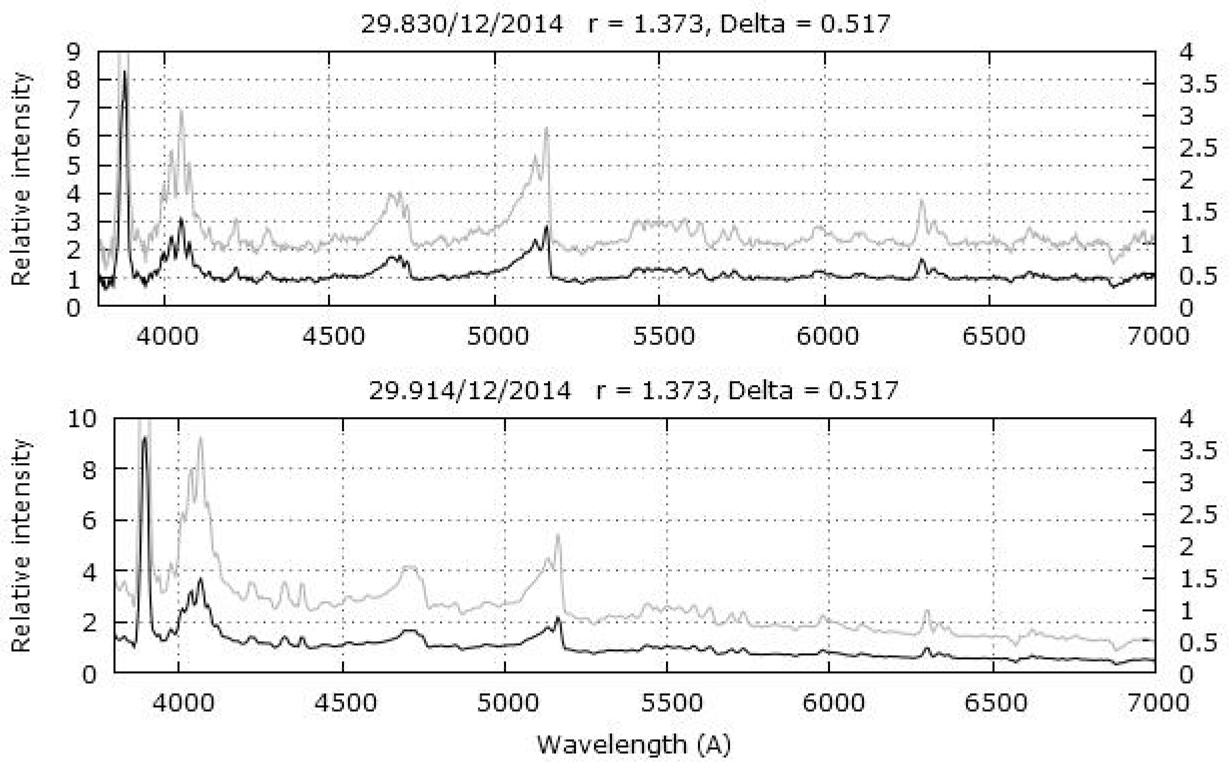
Spectral data in standard FITS are collected and made available through ARAS webpage:

http://www.astrosurf.com/aras/Aras_DataBase/Comets/Comets/Comets.htm

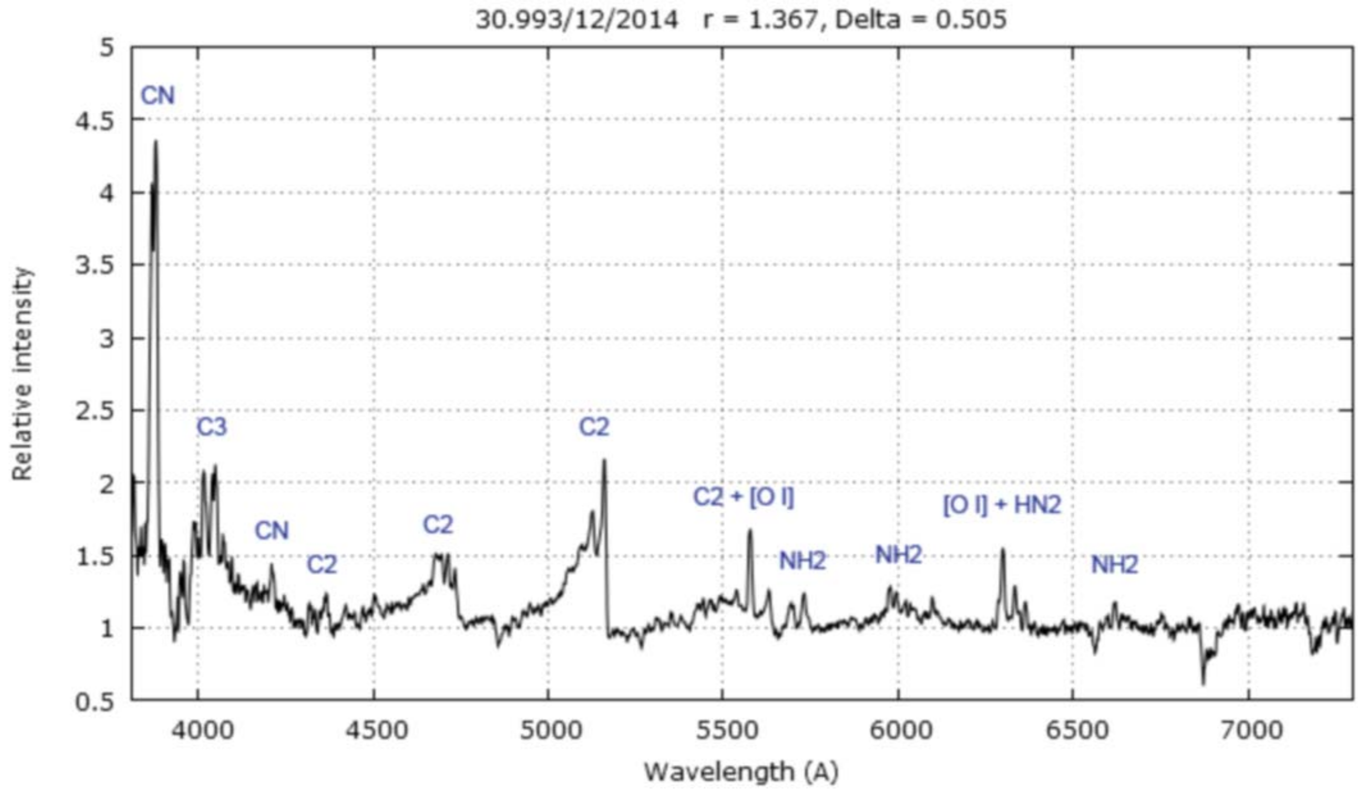
Many of them relating to false nucleus and inner coma (see specific cases in the name of files). Some profiles are divided by a solar analog spectrum (Moon or G2V type star), so the resulting spectrum is a combination of reflectance continuum and gas emissions. Other profiles are Sun spectrum subtracted, showing only the emission components.

We used a wide range of spectrographs/gratings and, thanks to comet brightness and actual powerful equipment, we were able to push resolving power up to R=50000! May be this is the first time a comet was observed with such a high detail by amateurs.

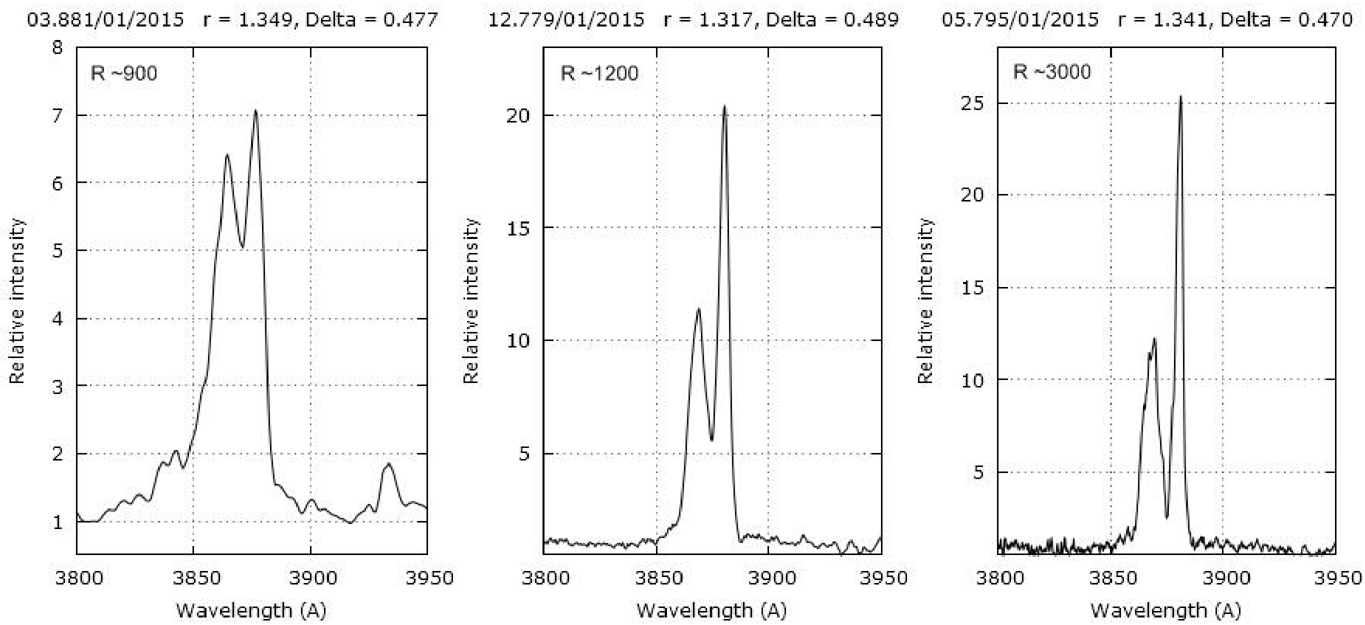
Northern hemisphere observers taken first spectra on 29 December 2014. Umberto Sollecchia and Pierre Dubreuil have observed the comet at low altitude above the horizon (V mag ~ 4.7) with a DIY spectrograph and an Alpy 600 respectively:



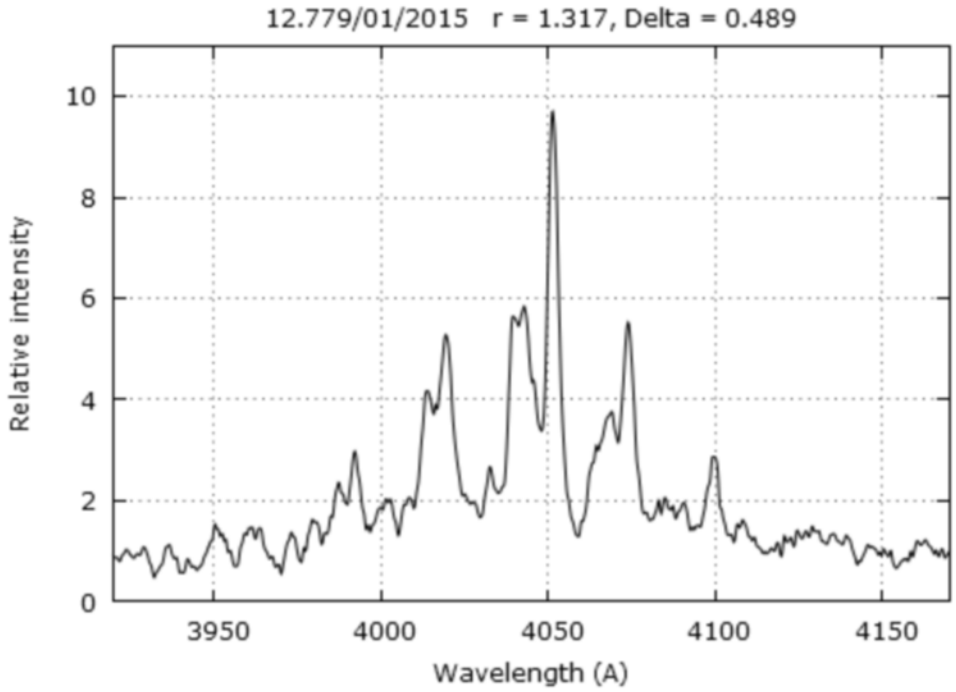
Spectrum by Jacques Montier (30/12/2014) with labels on main emission features (note there might be a terrestrial contribution of auroral 5577A emission line):



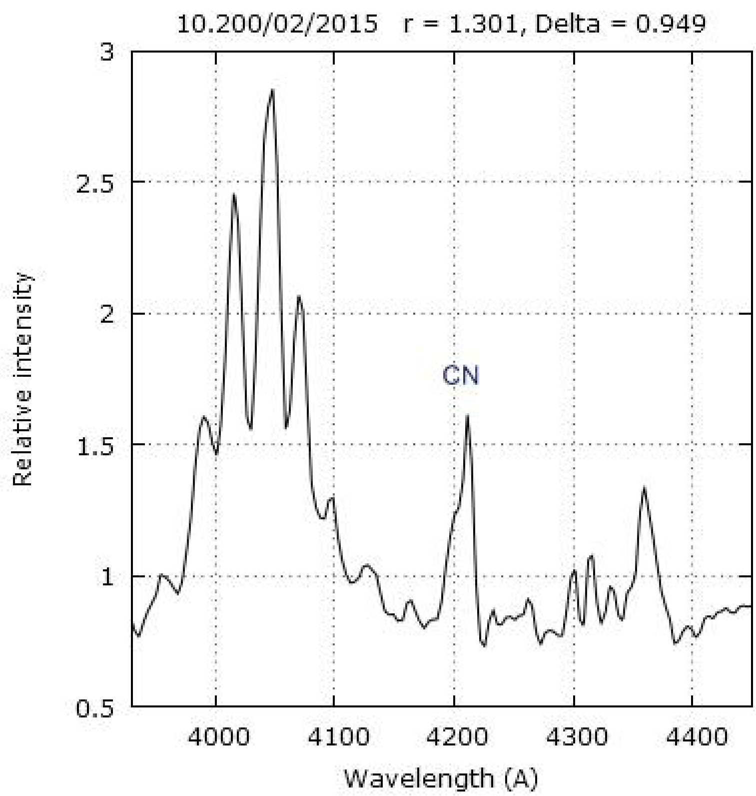
The CN electronic transitions produce the strong emission peak around 3875A. It is composed of two close branches (R-branch and P-branch). They are influenced by the presence of Fraunhofer absorption lines in the solar spectrum, so they strongly vary with heliocentric radial velocity of comet due to the Doppler shift (Swings effect, the same about Na D lines mentioned above). Also the heliocentric distance and the motion of radicals within the comet (cometary atmosphere is not stationary) have an impact, smaller, on their shape. The resolution allows the distinction of P and R branches but is still insufficient to resolve the rotational lines fine structure. CN bands in ARAS spectra by Joan Guarro, Christian Buil and Paolo Berardi (note the effect of spectral resolution on branches separation):



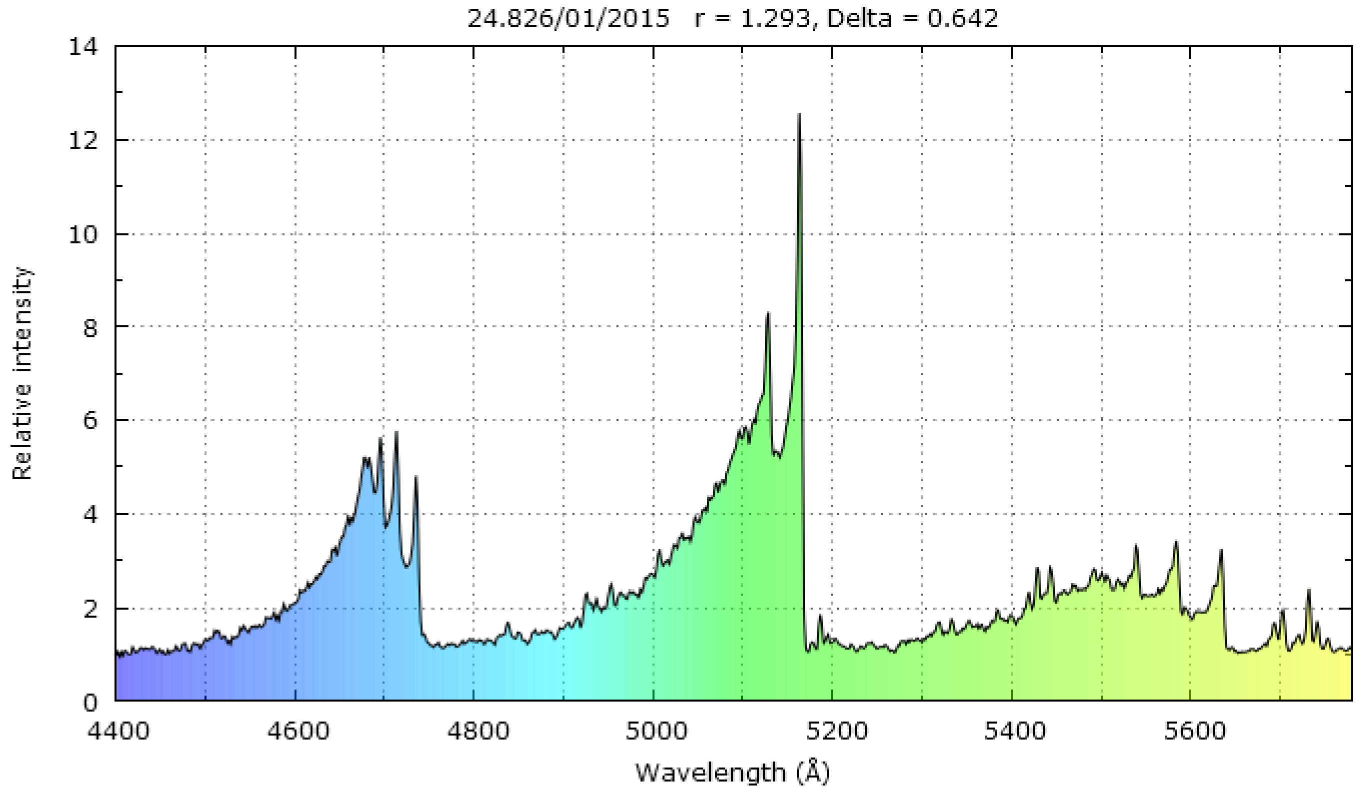
Basic structure of main C3 emission band. Since the difficulty of exciting C3 in the laboratory, identification of many lines is missing (lines attributable to this radical span from 3350 to 4700A). Spectrum by Christian Buil taken with a Lhires III spectrograph and 600 l/mm grating:



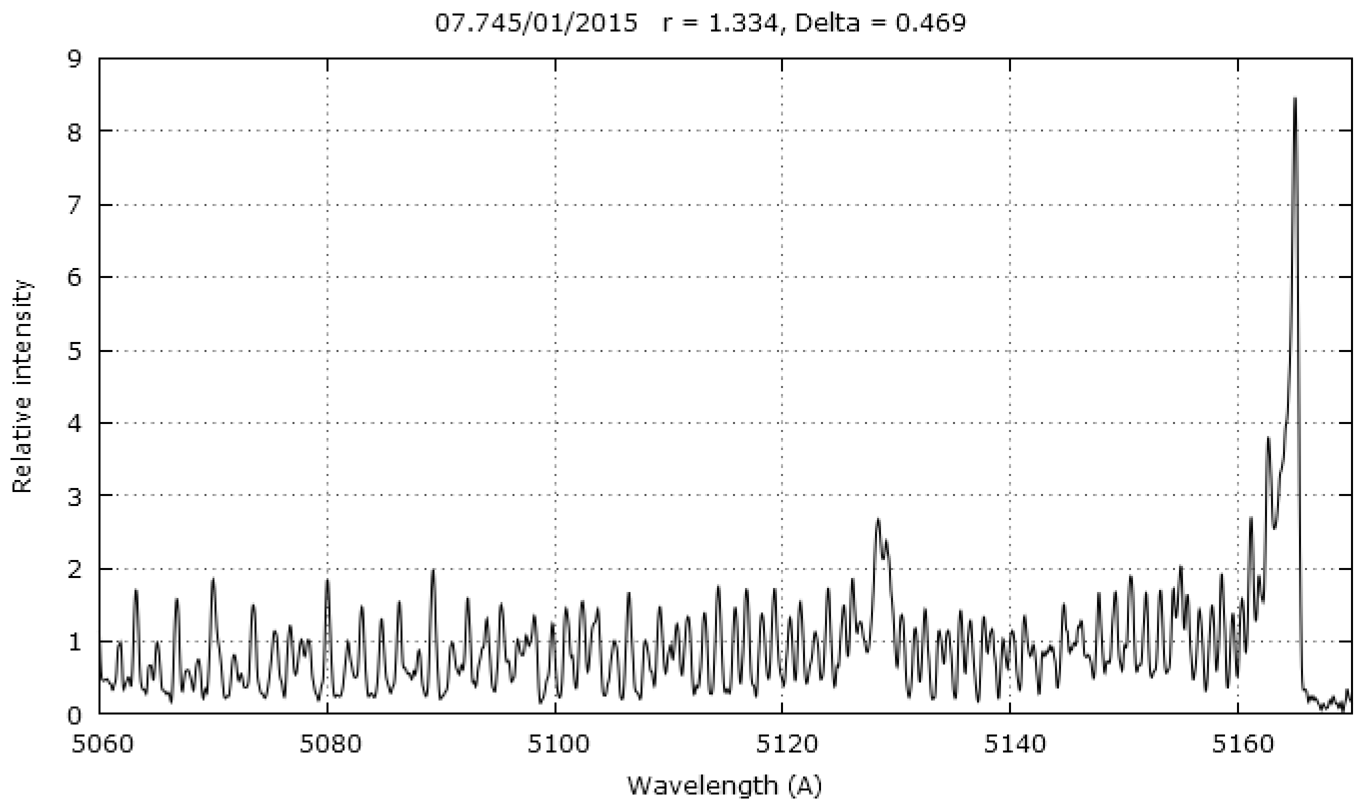
Another CN band from 4190 to 4215A is clearly visible in low-res profile by Jim Edlin (Lisa spectrograph):



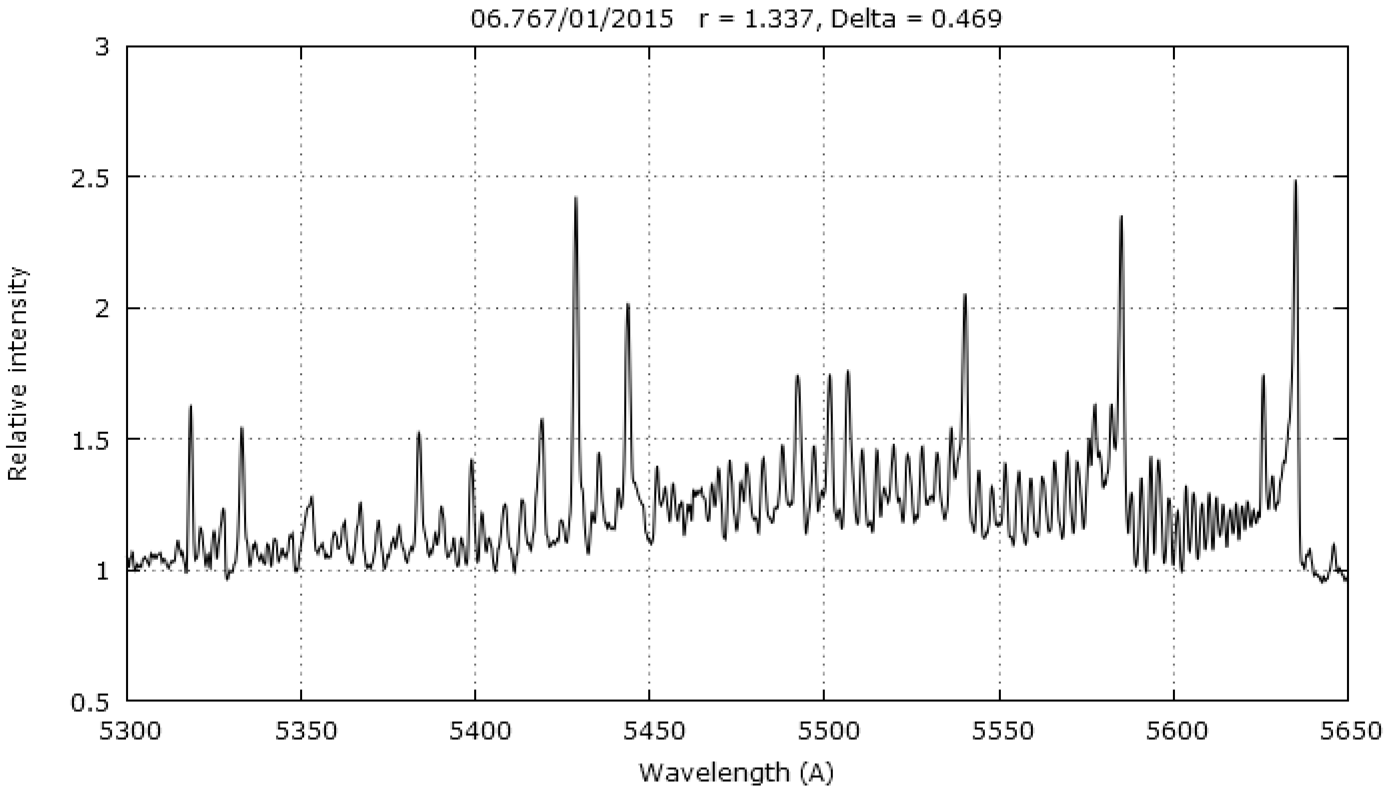
The main Swan bands of diatomic carbon C2 in a low-resolution spectrum (Lisa, R ~1200) by David Boyd, plotted with ISIS/Gnuplot and a modified script for coloration by Serge Golovanow. Some NH2 lines are included in the spectral interval:



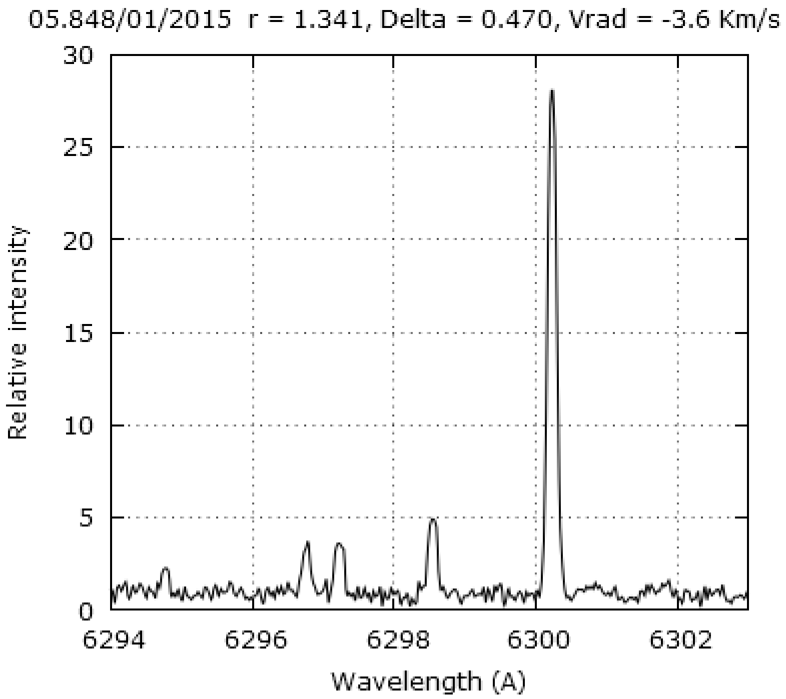
The first third of the most prominent Swan band with discerned fine structure (it need more resolution to resolve completely the rotational lines). High resolution spectrum by Christian Buil (eShel spectrograph, R ~11000). This is part of an excellent comet spectrum that span from 4280 to 7350A:



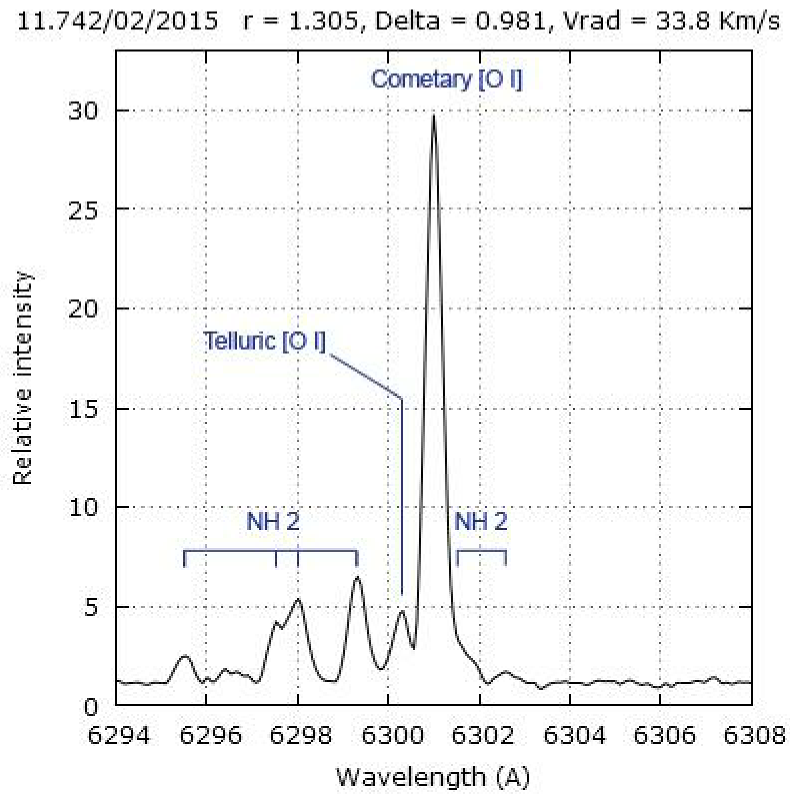
The Swan band from 5300 to 5650A range. Spectrum R ~ 5000 by Paolo Berardi (Lhires III, 1200 l/mm grating):



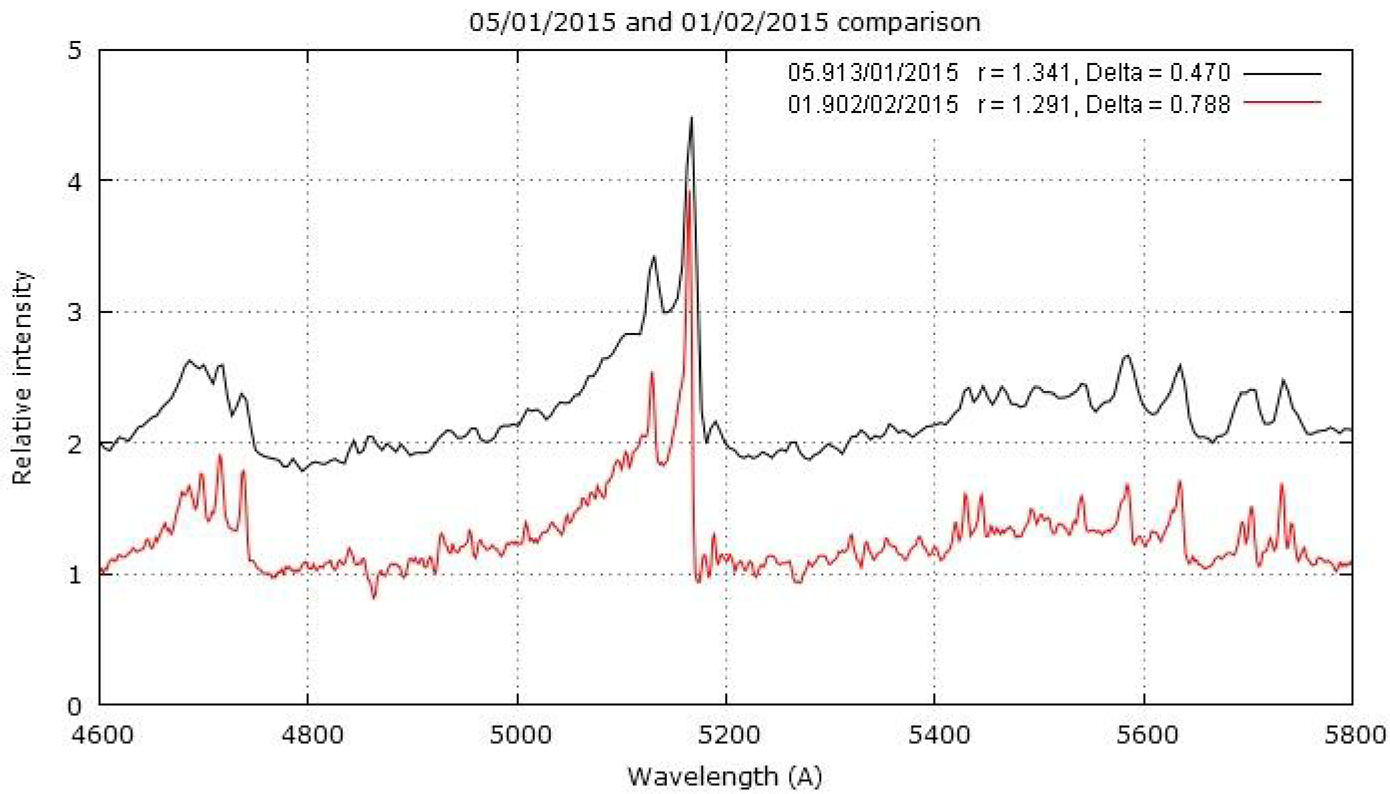
The oxygen [O I] 6300.304A line in a very high resolution spectrum (R ~50000). Christian Buil, VHIRES spectrograph. Some NH2 lines are visible to the left of the oxygen line. The geocentric radial velocity value is added in the title:



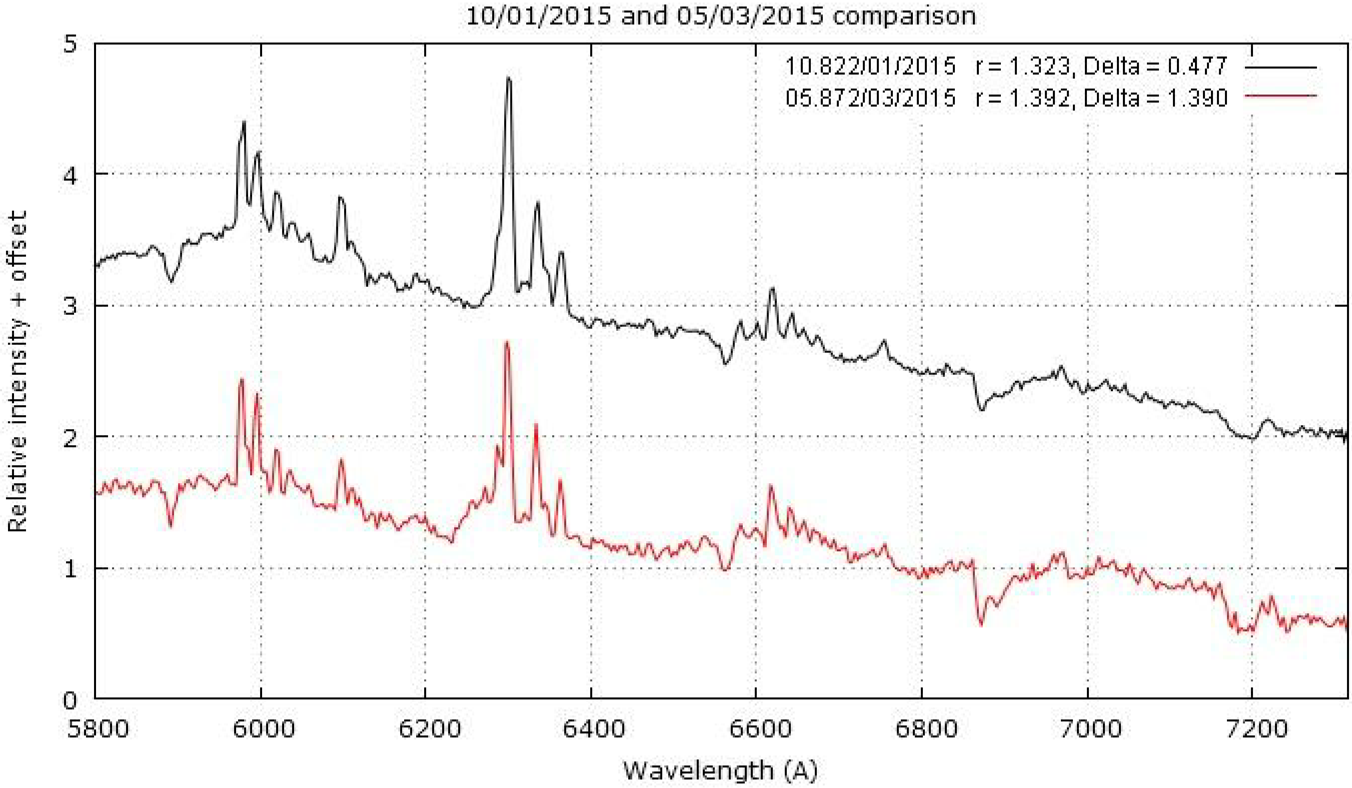
In low-res spectra, cometary [O I] 6300A is blended with airglow oxygen line (telluric origin) and nearby NH2 lines (0,8,0 band). High resolution spectra allow to separate oxygen line from the NH2 band members but cometary emission remains coincident with telluric line. In several long-slit observations (Lhires III) I have been able to check that airglow contribution was only a little fraction of cometary emission. That was clearly confirmed by a subsequent observation made when the comet moved away and geocentric velocity produced an appreciable red-shift of its spectrum (R ~15000, Lhires III, 2400 l/mm grating):



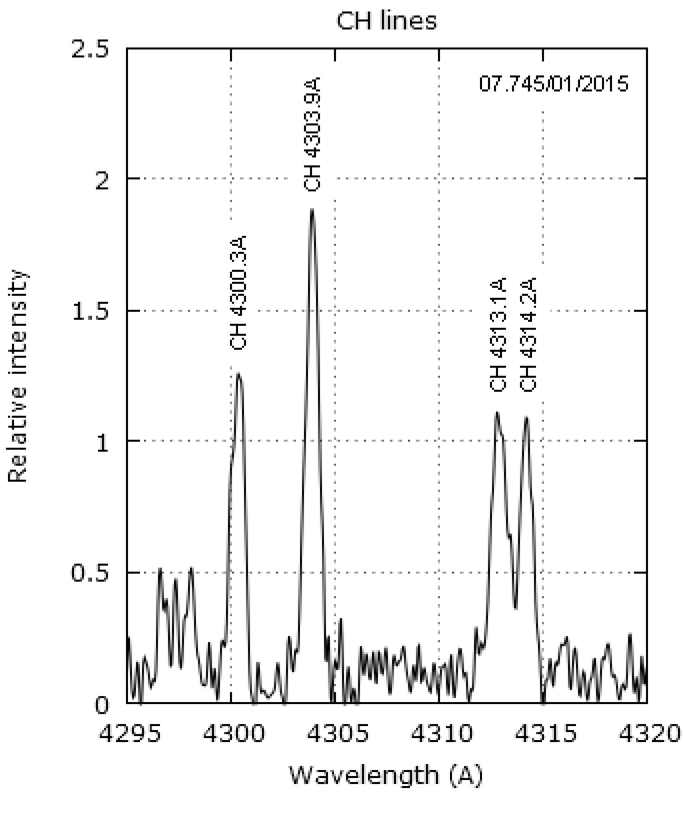
Spectral evolution of spectrum between 5/1 (Nico Montigiani/Massimiliano Mannucci, Lhires III 150) and 1/2 (David Boyd, Lisa):

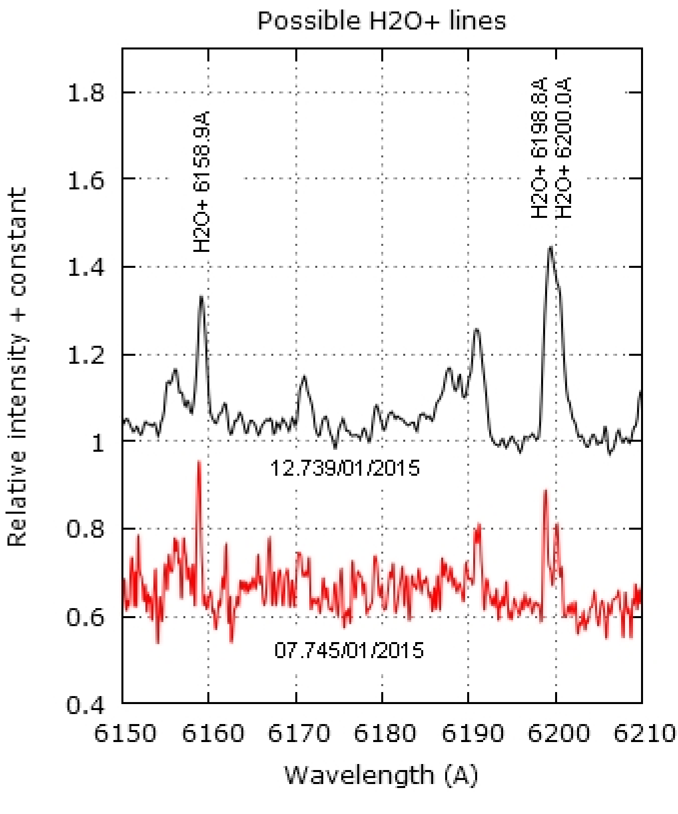


Spectral evolution of red part of spectrum between 10/1 (Francois Cochard, Alpy 600) and 5/3 (Hubert Boussier, Lisa):

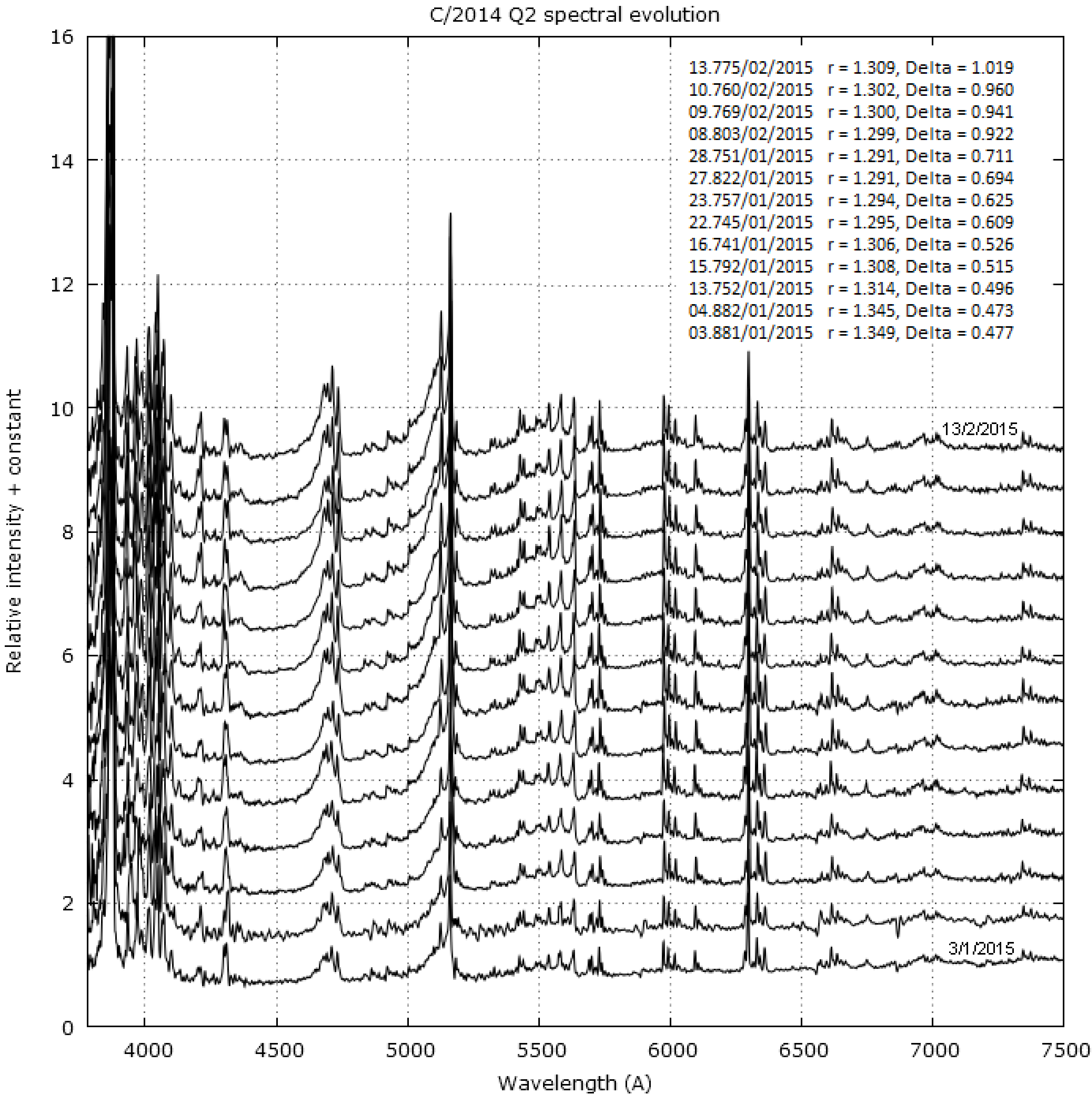


CH radicals derive from CH2, in turn by methane CH4, the probable parent molecule. Some lines of CH band near 4314A are clearly visible in high resolution spectrum (R ~11000, eShel spectrograph) by Christian Buil. Also lines of H2O+ ion with doublet at 6198 and 6200A could be present near 6200A in a pair of spectra (eShel - 7/1, Lhires III 1200 – 12/1). Unfortunately we have not comet tail spectra to confirm the H2O+ lines:

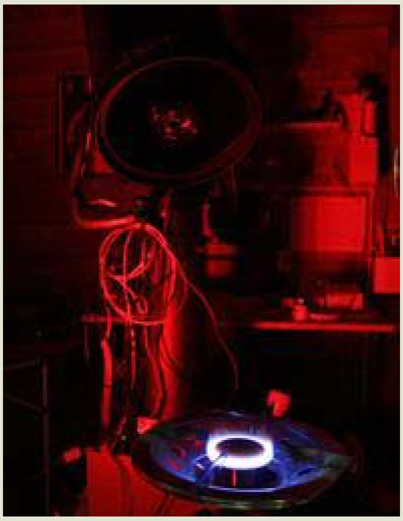




The great series of low-resolution spectra by Joan Guarro, obtained with B60050-VI DIY spectrograph (note this is a subset, there are other observations with a wide temporal coverage).

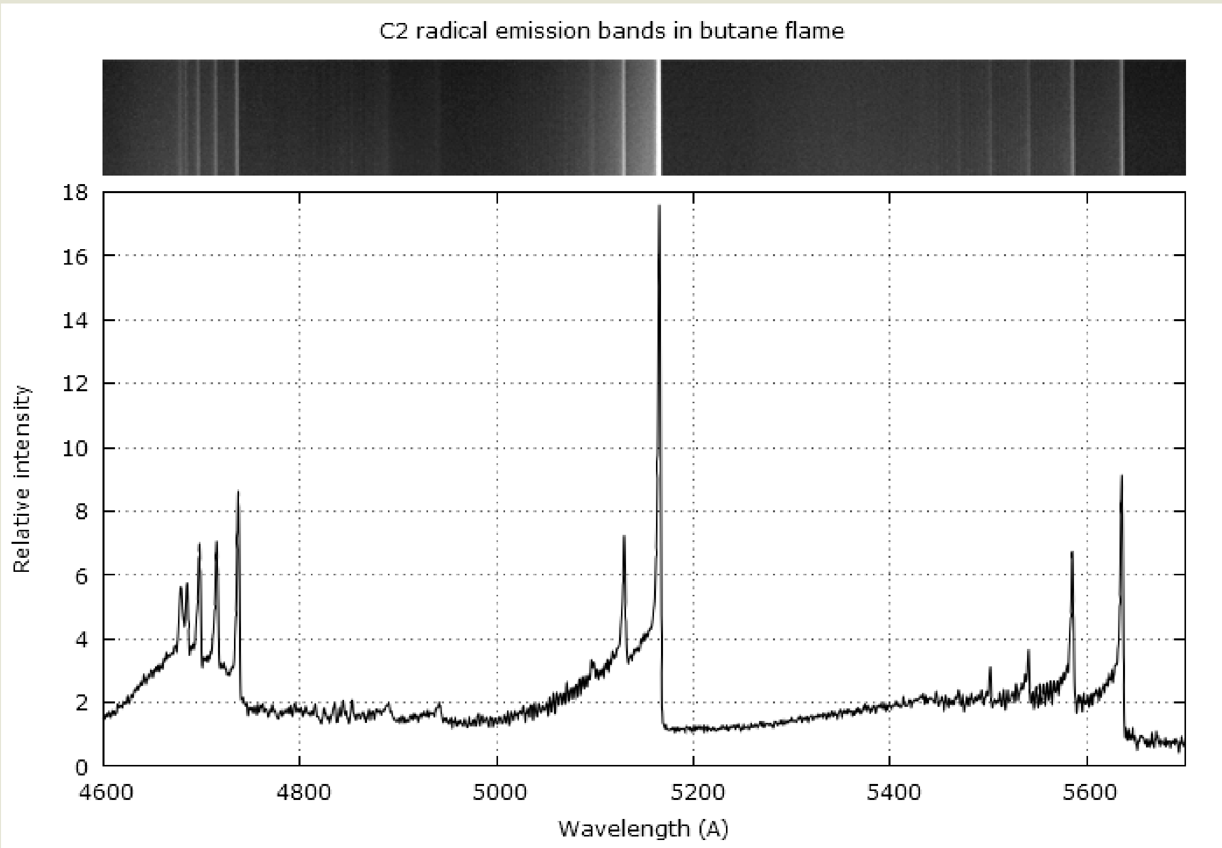


A homemade comet spectrum



C2 radicals are continuously produced by molecules dissociation in the flame of any hydrocarbons such as butane used for this “laboratory” experience. Then, you can observe the Swan emission bands in the spectrum of its flame. Note the color of the flame is not green but more bluish due to a strong CH emission band near 4315A (not included in the profile below). The spectrum is obtained using a Lhires III spectrograph with 600 l/mm grating (two spectral region joined to include the three main Swan bands). Note the analogy with the dominant C2 bands observed in the comet Lovejoy spectrum.

The famous emission bands bear the name of discoverer, William Swan, that studied laboratory flames and describes them to the Royal Society of Edimburgh in 1856. Gian Battista Donati was first to report the appearance of Swan bands in a comet spectrum (Tempel) in 1864 and William Huggins, in 1868, confirmed their presence in the spectrum of comet Winnecke.



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References

Cometary Spectroscopy
Nicolas Biver, LESIA, UMR8109 du CNRS, Observatoire de Paris-Meudon.

A High-Resolution Catalogue of Cometary Emission Lines
M.E. Brown, A.H. Bouchez, H. Spinrad, and C.M. Johns-Krull
Astronomical Journal, 112, 1197-1202, 1996

The cometary fluorescence spectrum of cyanogen: a model
M. Kleine, S. Wyckoff, P. Wehinger
The Astrophisical Journal, 436:885-906, 1994 December 1

Spectroscopic Investigations of Fragment Species in the Coma
Feldman, P. D.; Cochran, A. L.; Combi, M. R.
Comets II, M. C. Festou, H. U. Keller, and H. A. Weaver (eds.), University of Arizona Press, Tucson, 745 pp., p.425-447

Observations of O (1S) and O (1D) in Spectra of C/1999 S4 (LINEAR)
Anita L. Cochran, William D. Cochran
arXiv:astro-ph/0108065

Astrophysics - A modern perspective
K.S. Krishna Swamy
New Age International (P) Ldt., Publisher

Computational Spectroscopy: Methods, Experiments and Applications
Edited by Jörg Grunenberg - ISBN: 978-3-527-32649-5

About ARAS initiative

Astronomical Ring for Access to Spectroscopy (ARAS) is an informal group of volunteers who aim to promote cooperation between professional and amateur astronomers in the field of spectroscopy.

To this end, ARAS has prepared the following roadmap:

• Identify centers of interest for spectroscopic observation which could lead to useful, effective and motivating cooperation between professional and amateur astronomers.
• Help develop the tools required to transform this cooperation into action (i.e. by publishing spectrograph building plans, organizing group purchasing to reduce costs, developing and validating observation protocols, managing a data base, identifying available resources in professional observatories (hardware, observation time), etc.
•Develop an awareness and education policy for amateur astronomers through training sessions, the organization of pro/am seminars, by publishing documents (web pages), managing a forum, etc.
• Encourage observers to use the spectrographs available in mission observatories and promote collaboration between experts, particularly variable star experts.
• Create a global observation network.

By decoding what light says to us, spectroscopy is the most productive field in astronomy. It is now entering the amateur world, enabling amateurs to open the doors of astrophysics. Why not join us and be one of the pioneers!

Be Newsletter
Previous issues :
http://www.astrosurf.com/aras/surveys/beactu/index.htm

Searching for new Be Stars
Andrew Smith and Thierry Lemoult
New ARAS Page
http://www.astrosurf.com/aras/be_candidate/auto-be-candidate.html

Comet C2014_Q2 LOVEJOY
spectra gathered in ARAS data base
http://www.astrosurf.com/aras/Aras_DataBase/Comets/Comets/Comets.htm

Contribution to ARAS data base
From 01-03 to 31-03-2015

D. Boyd
C. Buil
J. Edlin
J. Guarro
J. Montier
J. Powles
U. Sollecchia
P. Somogyi
F. Teyssier

Further information :
Email francoismathieu.teyssier at bbox.fr

Submit your spectra

Please :
- respect the procedure
- check your spectra BEFORE sending them
Resolution should be at least R = 500
For new transcients, supernovae and poorly observed objects,
SA spectra at R = 100 are welcomed

1/ reduce your data into BeSS file format
2/ name your file with: _novadel2013_yyyymmdd_hhh_Observer
novadel2013: name of the nova, fixed for this object

Exemple: _chcyg_20130802_886_toto.fit

3/ send you spectra to
Novae, Symbiotics : François Teyssier
Supernovae : Christian Buil
to be included in the ARAS database

Download previous issues :
http://www.astrosurf.com/aras/novae/InformationLetter/InformationLetter.html